Individual life histories: Neither slow nor fast, just diverse

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23/11/2022

Load packages

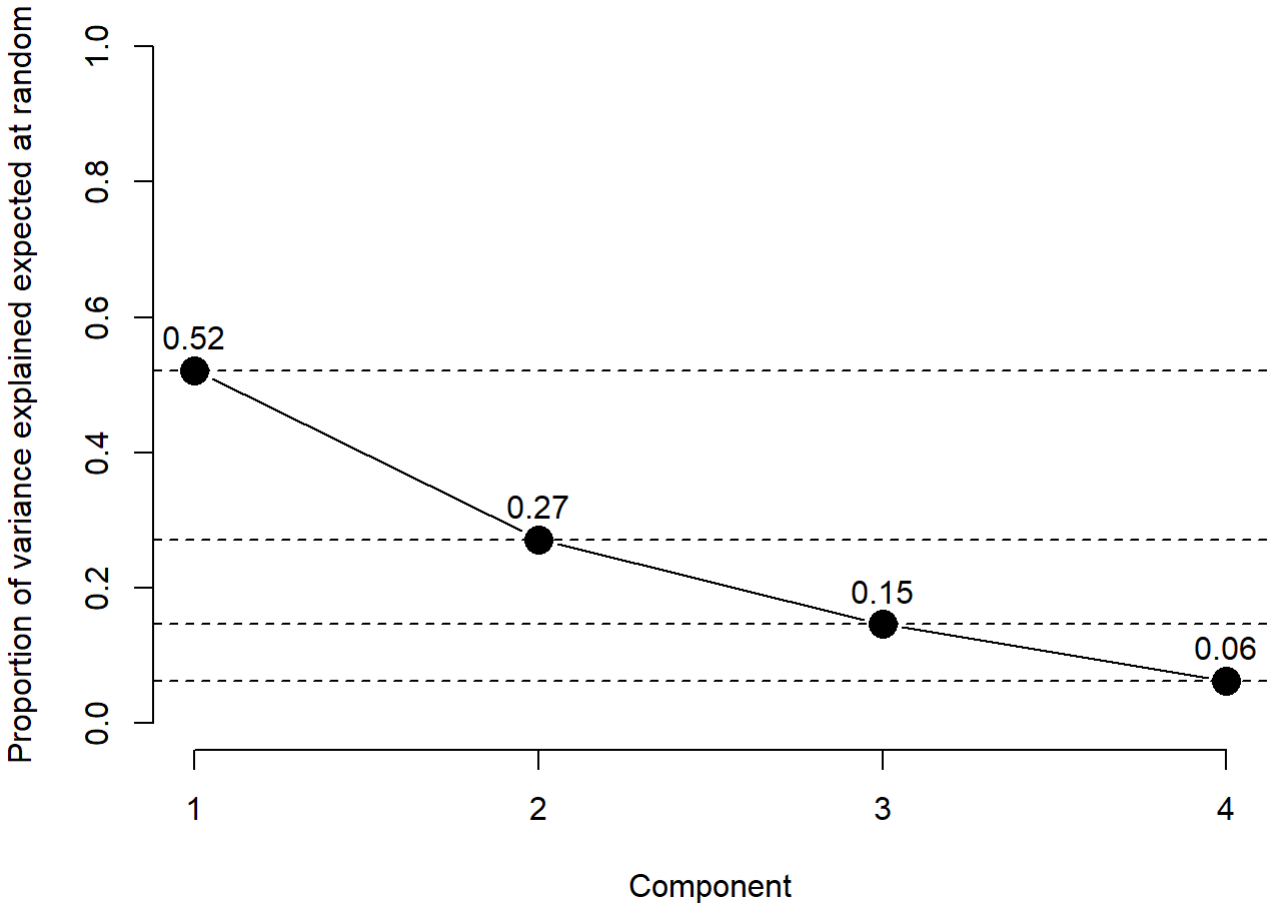
```
library(plyr)
library(popbio)
library(vegan)
library(tidyverse)
library(ade4)
library(phytools)
library(MCMCglmm)
library(mulTree)
library(caper)
library(plyr)
library(car)
```

Useful information and functions

```
scl <- 2

scaling <- function(x){
  (x-mean(x))/sd(x)
}

CV_fun <- function(x){
  sd(x)/mean(x)
}

transparency <- 1
colors <- c(rgb(73/255,67/255,166/255,transparency),
            rgb(253/255,231/255,194/255,transparency),
            rgb(3/255,71/255,72/255,transparency),
            rgb(191/255,105/255,0/255,transparency),
            rgb(141/255,36/255,146/255,transparency),
            rgb(173/255,170/255,108/255,transparency),
            rgb(20/255,18/255,67/255,transparency),
            rgb(52/255,143/255,65/255,transparency),
            rgb(224/255,39/255,0/255,transparency),
            rgb(155/255,91/255,100/255,transparency),
            rgb(201/255,228/255,108/255,transparency),
            rgb(131/255,188/255,169/255,transparency),
            rgb(224/255,160/255,0/255,transparency),
            rgb(20/255,100/255,229/255,transparency),
            rgb(255/255,222/255,51/255,transparency),
            rgb(0/255,128/255,167/255,transparency),
            rgb(250/255,18/255,87/255,transparency)
            )

#arrow colors
col_afr <- rgb(18/255,0/255,109/255,0.75)
col_breed <- rgb(194/255,85/255,0/255,0.75)
col_life <- rgb(0/255,117/255,102/255,0.75)
col_fec <- rgb(255/255,214/255,0/255,0.75)
col_points <- rgb(51/255,51/255,51/255,0.5)
```

Broken-stick model

```
# Calculate broken stick number of axes
n = 4 # four variables
bsm = data.frame(j=seq(1:n), p=0)
bsm$p[1] = 1/n
for (i in 2:n) bsm$p[i] = bsm$p[i-1] + (1/(n + 1 - i))
bsm$p = 100*bsm$p/n

par(mfrow=c(1,1), bty="n", mar=c(4,4,2,2))
plot(bsm[c(4:1), 2]/100, pch=16, type="b", xlab="Component", ylab="Proportion of variance explai
ned expected at random", xlim=c(1,4), ylim=c(0,1), cex=2, axes=F)
axis(1, at=seq(1,4,1))
axis(2, at=seq(0,1,0.2))
abline(h=bsm[1,2]/100, lty=2)
text(x=4, y=bsm[1,2]/100+0.05, label=round(bsm[1,2]/100, digits=2))
abline(h=bsm[2,2]/100, lty=2)
text(x=3, y=bsm[2,2]/100+0.05, label=round(bsm[2,2]/100, digits=2))
abline(h=bsm[3,2]/100, lty=2)
text(x=2, y=bsm[3,2]/100+0.05, label=round(bsm[3,2]/100, digits=2))
abline(h=bsm[4,2]/100, lty=2)
text(x=1, y=bsm[4,2]/100+0.05, label=round(bsm[4,2]/100, digits=2))
```



Load dataset

```
#load("...fulldataset.Rdata")

data <- data_NEE

head(data) # This dataset contains individual life-histories for the 17 species
```

```
##        species age_first_repro lifetime_adult breed_freq fecundity
## 1 bighornsheep               3             10  1.0000000 0.8000000
## 2 bighornsheep               3              6  1.0000000 1.0000000
## 3 bighornsheep               3             11  0.9090909 0.3636364
## 4 bighornsheep               2             16  1.0000000 0.6923077
## 5 bighornsheep               2             13  0.9230769 0.8461538
## 6 bighornsheep               3              7  0.8571429 0.4285714
##   generation_time
## 1        7.500000
## 2        5.500000
## 3        8.400000
## 4        8.000000
## 5        7.750000
## 6        6.333333
```

Summarise accross species

```
test <- data.frame(
  species_number = 1:17,
  species = sort(unique(data$species)),
  sample_size = ddply(data, .(species), summarise, length(age_first_repro))[,2],
  mean_primiparity = ddply(data, .(species), summarise, mean(age_first_repro))[,2],
  min_primiparity = ddply(data, .(species), summarise, min(age_first_repro))[,2],
  max_primiparity = ddply(data, .(species), summarise, max(age_first_repro))[,2],
  mean_gentime = ddply(data, .(species), summarise, mean(generation_time))[,2],
  min_gentime = ddply(data, .(species), summarise, min(generation_time))[,2],
  max_gentime = ddply(data, .(species), summarise, max(generation_time))[,2],
  mean_adultlife = ddply(data, .(species), summarise, mean(lifetime_adult))[,2],
  min_adultlife = ddply(data, .(species), summarise, min(lifetime_adult))[,2],
  max_adultlife = ddply(data, .(species), summarise, max(lifetime_adult))[,2],
  mean_fecundity = ddply(data, .(species), summarise, mean(fecundity))[,2],
  min_fecundity = ddply(data, .(species), summarise, min(fecundity))[,2],
  max_fecundity = ddply(data, .(species), summarise, max(fecundity))[,2],
  mean_breedingfreq = ddply(data, .(species), summarise, mean(breed_freq))[,2],
  min_breedingfreq = ddply(data, .(species), summarise, min(breed_freq))[,2],
  max_breedingfreq = ddply(data, .(species), summarise, max(breed_freq))[,2])

table_summary <- test[,c(1,2,3,4,7,10,13,16)] # This dataset contains species averages of life-h
istories for the 17 species
```

Conduct PCA across species (without phylogeny)

```
# Add 1 to fecundity to avoid having 0 values after log - this is for consistency with the withi
n population level
table_summary$mean_fecundity <- table_summary$mean_fecundity + 1

# Select the life history traits
traits <- c("mean_primiparity", "mean_adultlife", "mean_breedingfreq", "mean_fecundity")

# Perform the PCA
test.pca_all <- rda(log(table_summary[,traits]), scale=T, center=T)

# Summary information
sum_all <- summary(test.pca_all)
sum_all
```

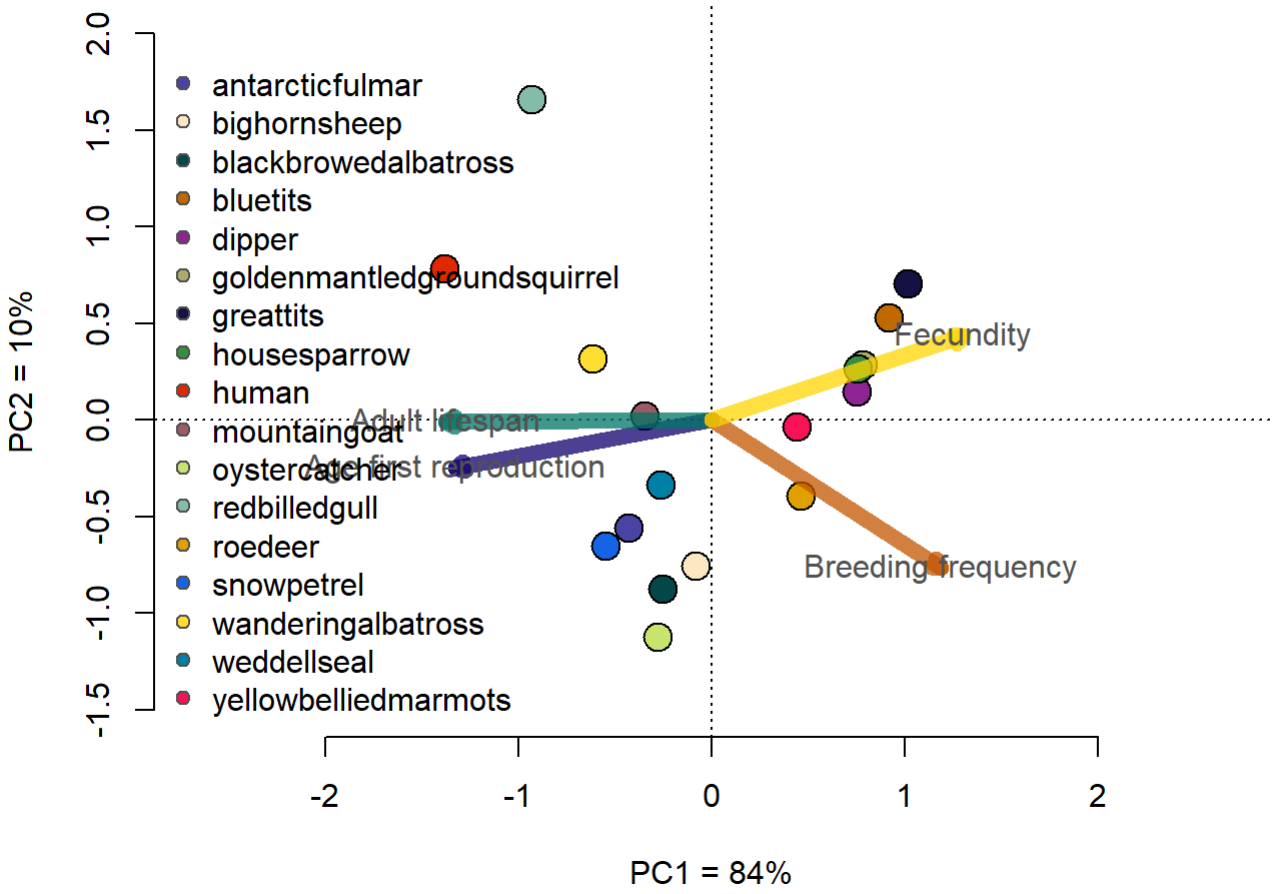
```
##
## Call:
## rda(X = log(table_summary[, traits]), scale = T, center = T)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2     PC3     PC4
## Eigenvalue            3.3747 0.4161 0.13631 0.07293
## Proportion Explained  0.8437 0.1040 0.03408 0.01823
## Cumulative Proportion 0.8437 0.9477 0.98177 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  2.828427
##
##
## Species scores
##
##                      PC1     PC2      PC3      PC4
## mean_primiparity  -1.327 -0.2464 -0.41549  0.06913
## mean_adultlife    -1.375 -0.0083  0.08001 -0.31865
## mean_breedingfreq  1.185 -0.7631 -0.03956 -0.11235
## mean_fecundity     1.301  0.4348 -0.30335 -0.16409
##
##
## Site scores (weighted sums of species scores)
##
##            PC1      PC2     PC3     PC4
## sit1  -0.42818 -0.55696 -0.8911  0.4744
## sit2  -0.08051 -0.75212  0.8018 -0.8565
## sit3  -0.25418 -0.87332 -0.5827  0.8410
## sit4   0.91890  0.52942 -0.1904 -0.4061
## sit5   0.75149  0.14854  0.6302  0.2357
## sit6   0.78226  0.28592 -0.2926 -0.1571
## sit7   1.01402  0.70646 -0.5986 -0.4617
## sit8   0.75835  0.26596  0.2089 -0.2402
## sit9  -1.38028  0.78176 -0.7015 -1.4932
## sit10 -0.34767  0.02015  0.4961  0.1838
## sit11 -0.27735 -1.12036  1.4740 -0.8777
## sit12 -0.92974  1.65903  1.1322  0.9511
## sit13  0.45976 -0.39125  0.3759  1.1612
## sit14 -0.54918 -0.64889 -0.6867  0.3494
## sit15 -0.61357  0.31593 -0.2565  0.6012
```

```
## sit16 -0.26482 -0.33659 -0.3927 -0.1736
## sit17  0.44071 -0.03367 -0.5264 -0.1317
```

```
# Test for proportion of variance explained per axe
prop <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  fec = c(1:4)
)

for (i in 1:4) {
  for (j in 1:4){
    prop[j,i+1] <- as.numeric(abs(sum_all$species[i,j])/sum(abs(sum_all$species[i,])))
  }
}

prop
```

```
##   PC       prim       adult      breed        fec
## 1  1 0.64485935 0.771685634 0.56422392 0.59045531
## 2  2 0.11970067 0.004656754 0.36342958 0.19736430
## 3  3 0.20185425 0.044888414 0.01883947 0.13769738
## 4  4 0.03358573 0.178769199 0.05350703 0.07448301
```

```
# Biplot figure
table_summary$species2 <- as.factor(table_summary$species)
species <- with(table_summary, levels(species2))

par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_all,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-1.5,2), xlim=c(-1.5,1.5),
main="", xlab="PC1 = 84%", ylab="PC2 = 10%")
with(table_summary, points(test.pca_all, display = "sites",  scaling = scl, pch = 21, bg = color
s[1:17],  cex=2))

g <- vegan::scores(test.pca_all, display = "species", choices=1:3)
len <- 1
off_factor <-0
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1]+off_factor, y=g[1,2], labels="Age first reproduction", col = "gray32")
text(x=g[2,1]+off_factor, y=g[2,2], labels="Adult lifespan", col = "gray32")
text(x=g[3,1]+off_factor, y=g[3,2], labels="Breeding frequency", col = "gray32")
text(x=g[4,1]+off_factor, y=g[4,2], labels="Fecundity", col = "gray32")
with(table_summary, legend("bottomleft", legend = species, bty = "n", col = "gray32", pch = 21,
pt.bg = colors))
```




```
# Correlation with generation time
species_score <- vegan::scores(test.pca_all, display = "sites", choices=1)
lm_gen_all <- lm(species_score ~ log10(table_summary$mean_gentime))
summary(lm_gen_all)
```

```
##
## Call:
## lm(formula = species_score ~ log10(table_summary$mean_gentime))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.48902 -0.07074  0.00239  0.13082  0.24124
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       1.08640    0.08568   12.68 2.03e-09 ***
## log10(table_summary$mean_gentime) -1.53520    0.10332  -14.86 2.22e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1842 on 15 degrees of freedom
## Multiple R-squared:  0.9364, Adjusted R-squared:  0.9321
## F-statistic: 220.8 on 1 and 15 DF,  p-value: 2.218e-10
```

pPCA across species - Including phylogeny

```
# Adjust the dataset (create a new one, data_trans) to fit with R functions
data_trans <- table_summary

# log-transform and scale data prior to PCA (this step is done directly in the rda function for
PCA, but has to be done beforehand in phytools)
trans_list <- c("mean_primiparity",
              "mean_breedingfreq",
              "mean_fecundity",
              "mean_adultlife")

data_trans[,trans_list] <- sapply(data_trans[,trans_list], function(x) log(x))
data_trans[,trans_list] <- sapply(data_trans[,trans_list], function(x) scaling(x))



# Adjust the names of species to match the phylogenetic trees
# Careful as some latin names were changed here compared to the table as synonyms were used in t
he Jetz phylogeny (this is the case for the blue tit and the black-browed albatross)
data_trans$animal <- ifelse(data_trans$species=="bighornsheep","Ovis_canadensis", data_trans$spe
cies)
data_trans$animal <- ifelse(data_trans$species=="mountaingoat","Oreamnos_americanus", data_trans
$animal)
data_trans$animal <- ifelse(data_trans$species=="antarcticfulmar","Fulmarus_glacialoides", data_
trans$animal)
data_trans$animal <- ifelse(data_trans$species=="goldenmantledgroundsquirrel","Spermophilus_late
ralis", data_trans$animal)
data_trans$animal <- ifelse(data_trans$species=="dipper","Cinclus_cinclus", data_trans$animal)
data_trans$animal <- ifelse(data_trans$species=="roedeer","Capreolus_capreolus", data_trans$anim
al)
data_trans$animal <- ifelse(data_trans$species=="wanderingalbatross","Diomedea_exulans", data_tr
ans$animal)
data_trans$animal <- ifelse(data_trans$species=="weddellseal","Leptonychotes_weddellii", data_tr
ans$animal)
data_trans$animal <- ifelse(data_trans$species=="snowpetrel","Pagodroma_nivea", data_trans$anima
l)
data_trans$animal <- ifelse(data_trans$species=="oystercatcher","Haematopus_ostralegus", data_tr
ans$animal)
data_trans$animal <- ifelse(data_trans$species=="human","Homo_sapiens", data_trans$animal)
data_trans$animal <- ifelse(data_trans$species=="housesparrow","Passer_domesticus", data_trans$a
nimal)
data_trans$animal <- ifelse(data_trans$species=="bluetits","Parus_caeruleus", data_trans$animal)
# Here I had to change this for a synonym.
data_trans$animal <- ifelse(data_trans$species=="blackbrowedalbatross","Thalassarche_melanophry
s", data_trans$animal) # here this is a synonym (replace the i by y)
data_trans$animal <- ifelse(data_trans$species=="yellowbelliedmarmots","Marmota_flaviventris", d
ata_trans$animal)
data_trans$animal <- ifelse(data_trans$species=="greattits","Parus_major", data_trans$animal)
data_trans$animal <- ifelse(data_trans$species=="redbilledgull","Larus_novaehollandiae", data_tr
ans$animal)
```

```
data_trans$species <- data_trans$animal
```

```
# Now load phylogenetic trees (these were built in the script Phylogenetic Construction_Final)
# axis_trees <- read.tree(".../PPCA_100_phylo.tre")
# There are 100 possible trees in this file

# Loop over the 100 trees
res_pca <- list()

for(i in 1:100){
  tree <- axis_trees[[i]]
  tree_name <- paste("tree", i, sep="_")

  data_m <- as.matrix(data_trans[,c(4,6,8,7)])
  row.names(data_m) <- as.factor(data_trans$species)
  Xi <- data_m

  pca<-phyl.pca(tree,Xi, method="lambda")

  ev_1 <-as.numeric(diag(pca$Eval))
  component_importance <- ev_1/sum(pca$Eval)

  prop <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  fec = c(1:4)
)
for (k in 1:4) {
  for (j in 1:4){
    prop[j,k+1] <- as.numeric(abs(pca$L[k,j])/sum(abs(pca$L[k,])))
  }
}

scores_species <- pca$S
scores_variables <- pca$L

list_1 <- list(
  tree_name = tree_name,
  pca = pca,
  ev = ev_1,
  component_importance = component_importance,
  variable_correlation = scores_variables,
  scores_species = scores_species,
  prop = prop
  )

res_pca[[i]] <- list_1

}

ev_all <- data.frame(
  ev1 = rep(0, 100),
```

```
  ev2 = rep(0, 100),
  ev3 = rep(0, 100),
  ev4 = rep(0, 100),
  npc = rep(0, 100)
)


prop_all <- data.frame(
  prop1 = rep(0, 100),
  prop2 = rep(0, 100),
  prop3 = rep(0, 100),
  prop4 = rep(0, 100)
)

score_variable_all <- data.frame(
  PC = c(1:4),
  primiparity = rep(0, 4*100),
  adultlife = rep(0, 4*100),
  breed_freq = rep(0, 4*100),
  fecundity = rep(0, 4*100)
)


score_species_all <- data.frame(
  species = rep(data_trans$species, 100),
  PC1 = rep(0, nrow(data_trans)*100),
  PC2 = rep(0, nrow(data_trans)*100),
  PC3 = rep(0, nrow(data_trans)*100),
  PC4 = rep(0, nrow(data_trans)*100))


for(i in 1:100){
  ev_all[i,c(1:4)] <- 100*res_pca[[i]]$ev/sum(res_pca[[i]]$ev)
  prop_all[i,] <- res_pca[[i]]$component_importance
  score_species_all[c((i+16*(i-1)):(i+16*(i-1)+16)), c(2:5)] <- res_pca[[i]]$scores_species[,c
(1:4)]
  score_variable_all[c((i+3*(i-1)):(i+3*(i-1)+3)), c(2:5)] <- res_pca[[i]]$prop[,c(2:5)]
  }

# proportion of variance explained by each axe
summary(prop_all[,c(1:4)])
```

```
##      prop1            prop2            prop3             prop4
##  Min.   :0.7646   Min.   :0.1040   Min.   :0.03161   Min.   :0.01823
##  1st Qu.:0.7700   1st Qu.:0.1626   1st Qu.:0.03284   1st Qu.:0.02449
##  Median :0.7741   Median :0.1683   Median :0.03348   Median :0.02472
##  Mean   :0.7842   Mean   :0.1586   Mean   :0.03344   Mean   :0.02375
##  3rd Qu.:0.7792   3rd Qu.:0.1715   3rd Qu.:0.03408   3rd Qu.:0.02493
##  Max.   :0.8437   Max.   :0.1768   Max.   :0.03503   Max.   :0.02552
```

```
# Proportion of variance explained by life-history traits
# PC1
summary(abs(score_variable_all[which(score_variable_all$PC == 1),c(2:5)]))
```

```
##   primiparity       adultlife        breed_freq       fecundity
##  Min.   :0.5523   Min.   :0.6227   Min.   :0.5642   Min.   :0.4726
##  1st Qu.:0.5612   1st Qu.:0.6358   1st Qu.:0.5921   1st Qu.:0.4799
##  Median :0.5648   Median :0.6403   Median :0.5943   Median :0.4837
##  Mean   :0.5768   Mean   :0.6610   Mean   :0.5898   Mean   :0.4999
##  3rd Qu.:0.5719   3rd Qu.:0.6519   3rd Qu.:0.5958   3rd Qu.:0.4891
##  Max.   :0.6449   Max.   :0.7717   Max.   :0.5988   Max.   :0.5905
```

```
# PC2
summary(abs(score_variable_all[which(score_variable_all$PC == 2),c(2:5)]))
```

```
##   primiparity       adultlife          breed_freq       fecundity
##  Min.   :0.1197   Min.   :0.004657   Min.   :0.3580   Min.   :0.1974
##  1st Qu.:0.1914   1st Qu.:0.103638   1st Qu.:0.3612   1st Qu.:0.2757
##  Median :0.1960   Median :0.112129   Median :0.3624   Median :0.2831
##  Mean   :0.1844   Mean   :0.095630   Mean   :0.3624   Mean   :0.2701
##  3rd Qu.:0.1987   3rd Qu.:0.116788   3rd Qu.:0.3634   3rd Qu.:0.2878
##  Max.   :0.2049   Max.   :0.126970   Max.   :0.3671   Max.   :0.2962
```

```
# PC3
summary(abs(score_variable_all[which(score_variable_all$PC == 3),c(2:5)]))
```

```
##   primiparity       adultlife         breed_freq          fecundity
##  Min.   :0.2019   Min.   :0.04489   Min.   :1.853e-05   Min.   :0.06906
##  1st Qu.:0.2203   1st Qu.:0.09222   1st Qu.:9.253e-04   1st Qu.:0.08440
##  Median :0.2238   Median :0.09843   Median :2.038e-03   Median :0.09097
##  Mean   :0.2214   Mean   :0.09159   Mean   :4.481e-03   Mean   :0.09647
##  3rd Qu.:0.2276   3rd Qu.:0.10460   3rd Qu.:3.238e-03   3rd Qu.:0.09957
##  Max.   :0.2331   Max.   :0.11583   Max.   :1.884e-02   Max.   :0.13770
```

```
# PC4
summary(abs(score_variable_all[which(score_variable_all$PC == 4),c(2:5)]))
```

```
##   primiparity          adultlife        breed_freq        fecundity
##  Min.   :0.0008557   Min.   :0.1345   Min.   :0.03857   Min.   :0.07448
##  1st Qu.:0.0089941   1st Qu.:0.1440   1st Qu.:0.04069   1st Qu.:0.13733
##  Median :0.0163090   Median :0.1484   Median :0.04172   Median :0.14355
##  Mean   :0.0174141   Mean   :0.1518   Mean   :0.04335   Mean   :0.13350
##  3rd Qu.:0.0266340   3rd Qu.:0.1534   3rd Qu.:0.04325   3rd Qu.:0.14760
##  Max.   :0.0335850   Max.   :0.1788   Max.   :0.05351   Max.   :0.15727
```

```
# Loadings for each axe
loadings <- data.frame()

for (i in 1:100){
  res <- res_pca[[i]]$variable_correlation
  loading <- data.frame(
    PC = 1:4,
    primiparity = as.numeric(res[1,]),
    adultlife = as.numeric(res[2,]),
    breed_freq = as.numeric(res[3,]),
    fecundity = as.numeric(res[4,])
  )
  loadings = rbind(loadings, loading)
}

summary(abs(loadings[which(loadings$PC == 1), "primiparity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.8752  0.8820  0.8841  0.8920  0.8868  0.9386
```

```
summary(abs(loadings[which(loadings$PC == 2), "primiparity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1742  0.2982  0.3067  0.2867  0.3113  0.3242
```

```
summary(abs(loadings[which(loadings$PC == 3), "primiparity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.2938  0.3480  0.3509  0.3432  0.3552  0.3632
```

```
summary(abs(loadings[which(loadings$PC == 4), "primiparity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00132 0.01393 0.02557 0.02676 0.04203 0.05330
```

```
summary(abs(loadings[which(loadings$PC == 1), "adultlife"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.9437  0.9482  0.9500  0.9533  0.9533  0.9726
```

```
summary(abs(loadings[which(loadings$PC == 2), "adultlife"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00587 0.15187 0.16648 0.14186 0.17412 0.19242
```

```
summary(abs(loadings[which(loadings$PC == 3), "adultlife"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.05658 0.13540 0.14614 0.13442 0.15582 0.17553
```

```
summary(abs(loadings[which(loadings$PC == 4), "adultlife"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.2038  0.2145  0.2198  0.2189  0.2253  0.2291
```

```
summary(abs(loadings[which(loadings$PC == 1), "breed_freq"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.8377  0.8500  0.8521  0.8502  0.8537  0.8565
```

```
summary(abs(loadings[which(loadings$PC == 2), "breed_freq"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.5129  0.5175  0.5198  0.5225  0.5237  0.5396
```

```
summary(abs(loadings[which(loadings$PC == 3), "breed_freq"]))
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 2.655e-05 1.324e-03 2.922e-03 6.579e-03 4.649e-03 2.797e-02
```

```
summary(abs(loadings[which(loadings$PC == 4), "breed_freq"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.05530 0.05829 0.05978 0.06259 0.06202 0.07944
```

```
summary(abs(loadings[which(loadings$PC == 1), "fecundity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.8113  0.8204  0.8260  0.8399  0.8339  0.9198
```

```
summary(abs(loadings[which(loadings$PC == 2), "fecundity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.3074  0.4710  0.4837  0.4568  0.4919  0.5074
```

```
summary(abs(loadings[which(loadings$PC == 3), "fecundity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1174  0.1442  0.1561  0.1615  0.1705  0.2145
```

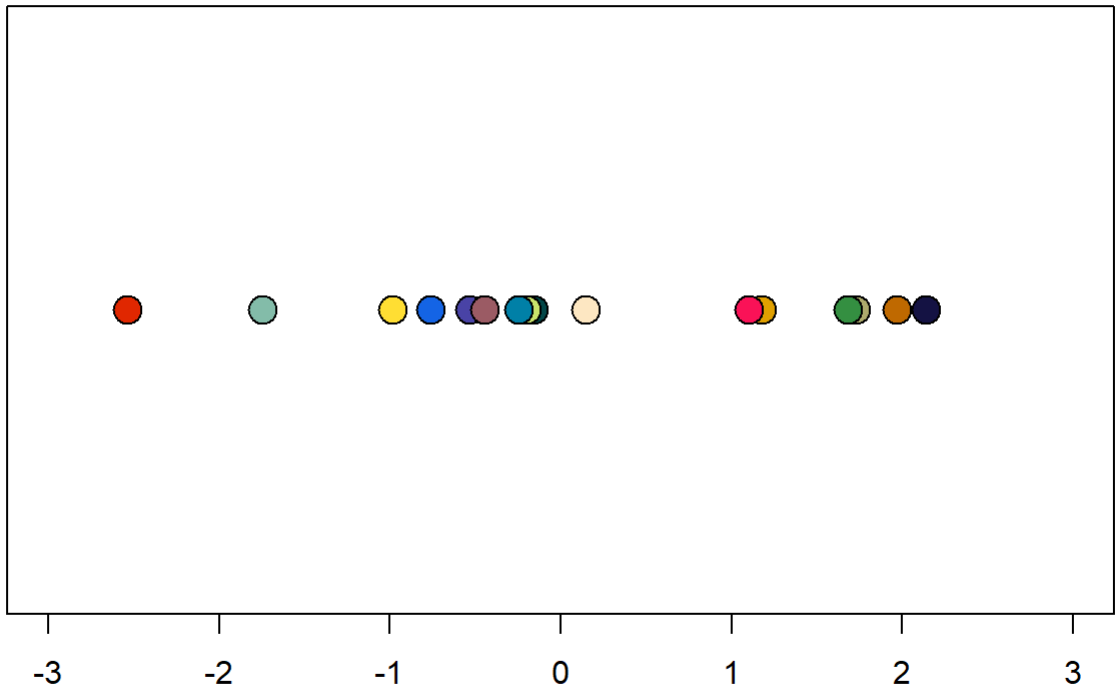
```
summary(abs(loadings[which(loadings$PC == 4), "fecundity"]))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1160  0.2352  0.2456  0.2263  0.2521  0.2673
```

```
# Correlation with generation time
cor_estimates <- data.frame(
  cor.value = rep(0, 100),
  beta = rep(0, 100),
  SE = rep(0, 100),
  P = rep(0, 100),
  R2 = rep(0, 100)
)

for(i in 1:100){
  tmp <- res_pca[[i]]$scores_species
  score <- as.numeric(tmp[,1])
  gen_time <- table_summary$mean_gentime
  test <- lm(score ~ gen_time)

  cor_estimates$beta[i] <- abs(test$coefficients[2])
  test2 <- summary(test)
  cor_estimates$R2[i] <- test2$r.squared
  cor_estimates$SE[i] = abs(test2$coefficients[2,2])
  cor_estimates$P[i] = test2$coefficients[2,4]

  cor <- cor.test(score, gen_time)
  cor_estimates$cor.value[i] <- abs(cor$estimate)

}

summary(cor_estimates)
```

```
##    cor.value           beta              SE                P
##  Min.   :0.8842   Min.   :0.2148   Min.   :0.02924   Min.   :2.340e-06
##  1st Qu.:0.8844   1st Qu.:0.2154   1st Qu.:0.02930   1st Qu.:2.394e-06
##  Median :0.8846   Median :0.2156   Median :0.02934   Median :2.419e-06
##  Mean   :0.8846   Mean   :0.2160   Mean   :0.02941   Mean   :2.419e-06
##  3rd Qu.:0.8848   3rd Qu.:0.2159   3rd Qu.:0.02938   3rd Qu.:2.452e-06
##  Max.   :0.8851   Max.   :0.2188   Max.   :0.02981   Max.   :2.477e-06
##        R2
##  Min.   :0.7818
##  1st Qu.:0.7821
##  Median :0.7825
##  Mean   :0.7825
##  3rd Qu.:0.7828
##  Max.   :0.7835
```

```
# Get species' positions on the slow-fast continuum
species_pos <- ddply(score_species_all, .(species), summarize,  h = mean(PC1))

# Order species according to their score on PC1
species_pos_new <- species_pos[match(data_trans$species, species_pos$species), ]
stripchart(species_pos_new$h,vertical=F,pch = 21, bg = colors[1:17], cex=2, xlim=c(-3,3))
```



pPCA across species - Including average phylogeny

```
# get the average tree (this takes several minutes - can use the Rdata instead) Note that result
s may vary according to the average tree computed
# average_tree <- averageTree(axis_trees)
# save(average_tree, file="C:/Users/joani/Documents/PostDoc/Manuscripts/Life history strategies/
IntRA-specific POL/Data and analyses/Average.phyTree.Rdata")
```

```
#load(".../Average.phyTree.Rdata")

# Transform data to perform the pPCA - log transformation and scaling was applied to data_trans
above. Transform to matrix format
data_m <- as.matrix(data_trans[,c(4,6,8,7)])
row.names(data_m) <- as.factor(data_trans$species)

# Conduct the pPCA
ppca <- phyl.pca(average_tree, data_m, method="lambda")
sum_ppca <- summary(ppca)
```

```
## Importance of components:
##                             PC1        PC2        PC3        PC4
## Standard deviation     0.1731435 0.08094124 0.03598391 0.03100480
## Proportion of Variance 0.7729192 0.16891236 0.03338400 0.02478447
## Cumulative Proportion  0.7729192 0.94183152 0.97521553 1.00000000
```

```
sum_ppca
```

```
## $sdev
##        PC1        PC2        PC3        PC4
## 0.17314349 0.08094124 0.03598391 0.03100480
##
## $importance
##                             PC1        PC2        PC3        PC4
## Standard deviation     0.1731435 0.08094124 0.03598391 0.03100480
## Proportion of Variance 0.7729192 0.16891236 0.03338400 0.02478447
## Cumulative Proportion  0.7729192 0.94183152 0.97521553 1.00000000
##
## attr(,"class")
## [1] "summary.phyl.pca"
```

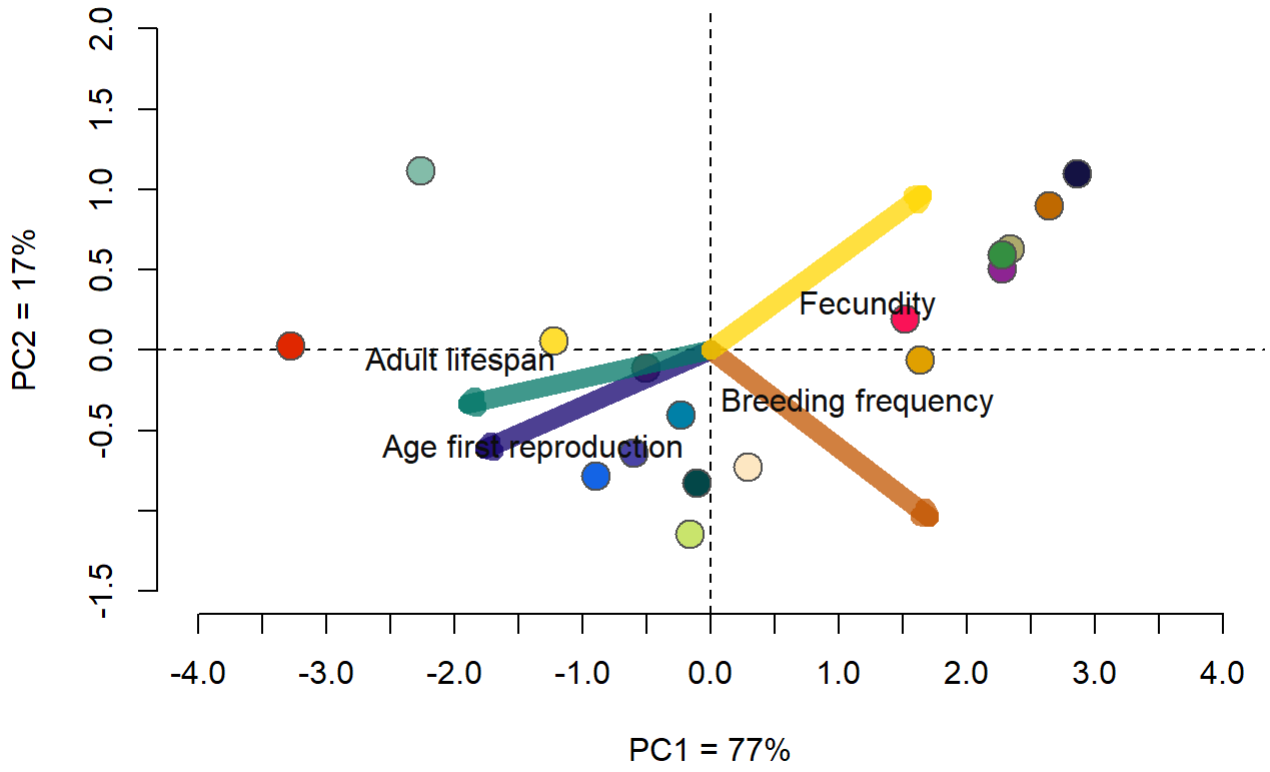
```r
# Test for proportion of variance explained per axe
prop <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  fec = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop[j,i+1] <- as.numeric(abs(ppca$L[i,j])/sum(abs(ppca$L[i,])))
  }
}

prop
```

```
##   PC       prim     adult       breed        fec
## 1  1 0.56357613 0.6400214 0.594226878 0.48299976
## 2  2 0.19694838 0.1121023 0.362378153 0.28348218
## 3  3 0.22526610 0.1010094 0.001929031 0.08888867
## 4  4 0.01420939 0.1468669 0.041465938 0.14462939
```

```r
# Correlation with generation time
lm_gen <- lm(as.numeric(ppca$S[,"PC1"])~table_summary$mean_gentime)
summary(lm_gen)
```

```
##
## Call:
## lm(formula = as.numeric(ppca$S[, "PC1"]) ~ table_summary$mean_gentime)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.2253 -0.4938  0.1362  0.4990  1.1037
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                   2.09374    0.31420   6.664 7.56e-06 ***
## table_summary$mean_gentime -0.21555    0.02934  -7.348 2.41e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8714 on 15 degrees of freedom
## Multiple R-squared:  0.7826, Adjusted R-squared:  0.7681
## F-statistic: 53.99 on 1 and 15 DF,  p-value: 2.414e-06
```

```
# Figure
species <- data.frame(ppca$S)
species <- species[,c(1:2)]
species[,2] <- species[,2]*-1
plot(species, type="n", axes=F,  ylim=c(-1.5,2), xlim=c(-4,4), main="", xlab="PC1 = 77%", ylab
="PC2 = 17%")
axis(1, at=seq(-4,4, 0.5))
axis(2, at=seq(-1.5,2,0.5))
abline(h=0, lty=2)
abline(v=0, lty=2)
points(species, pch = 21, bg = colors[1:17],  cex=2, col="gray32")

g <- data.frame(ppca$L)
g <- g[,c(1:2)]
g[,2] <- g[,2]*-1
len <- 2
off_factor <-0
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=10)
text(x=g[1,1]-0.5, y=g[1,2]-0.3, labels="Age first reproduction", col = "gray5")
text(x=g[2,1]-1, y=g[2,2]+0.1, labels="Adult lifespan", col = "gray5")
text(x=g[3,1]+0.3, y=g[3,2]+0.2, labels="Breeding frequency", col = "gray5")
text(x=g[4,1]+0.4, y=g[4,2]-0.2, labels="Fecundity", col = "gray5")
```



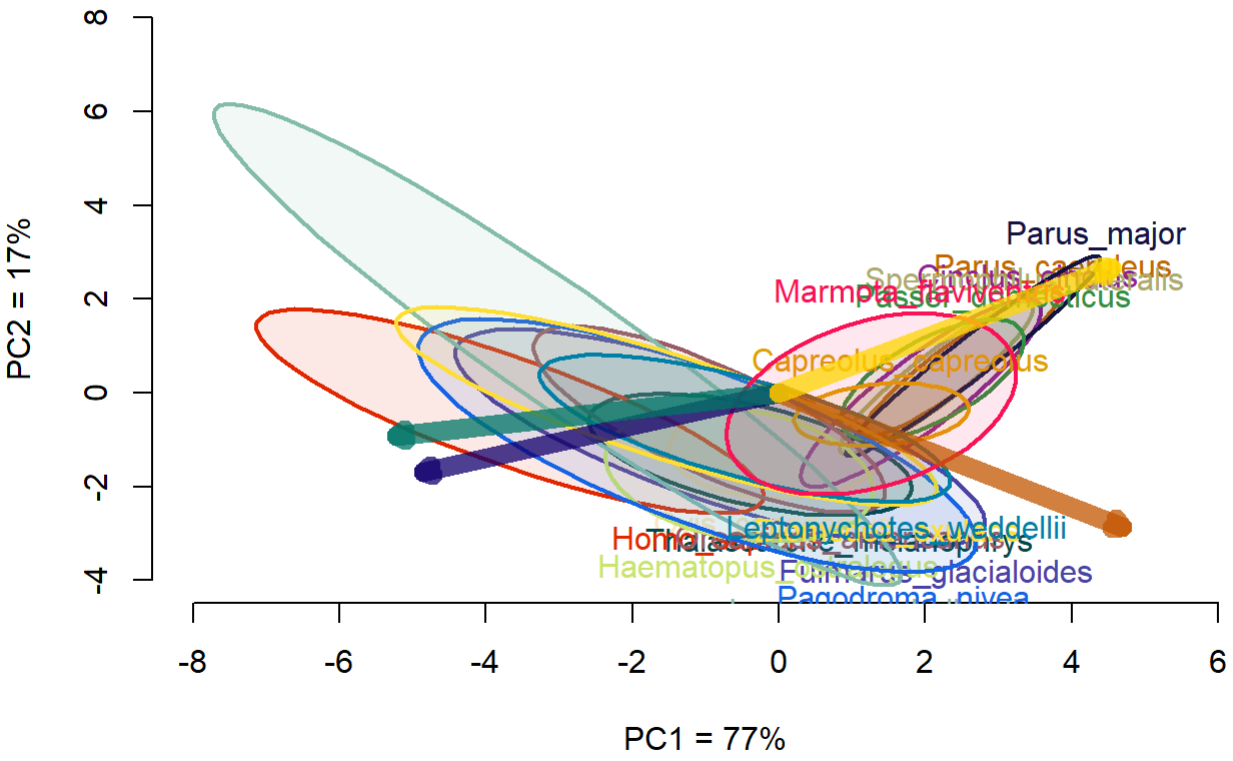
pPCA across species - Including average phylogeny

+ Individual data

```
# Transform individual data for projection on species pPCA
data_trans2 <- data
data_trans2$fecundity <- data_trans2$fecundity +1


# 2 Log-transform and scale life history traits
trans_list2 <- c("age_first_repro",
              "breed_freq",
              "fecundity",
              "lifetime_adult")


data_trans2[,trans_list2] <- sapply(data_trans2[,trans_list2], function(x) log(x)) # don't scale the individual data at this stage - will do later

# The names of species also have to change to match the phylogenetic trees
# Careful as some latin names were changed here compared to the table as synonyms were used in t he Jetz phylogeny (this is the case for the blue tit and the black-browed albatross)
data_trans2$animal <- ifelse(data_trans2$species=="bighornsheep","Ovis_canadensis", data_trans2 $species)
data_trans2$animal <- ifelse(data_trans2$species=="mountaingoat","Oreamnos_americanus", data_tra ns2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="antarcticfulmar","Fulmarus_glacialoides", dat a_trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="goldenmantledgroundsquirrel","Spermophilus_la teralis", data_trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="dipper","Cinclus_cinclus", data_trans2$anima l)
data_trans2$animal <- ifelse(data_trans2$species=="roedeer","Capreolus_capreolus", data_trans2$a nimal)
data_trans2$animal <- ifelse(data_trans2$species=="wanderingalbatross","Diomedea_exulans", data_ trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="weddellseal","Leptonychotes_weddellii", data_ trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="snowpetrel","Pagodroma_nivea", data_trans2$an imal)
data_trans2$animal <- ifelse(data_trans2$species=="oystercatcher","Haematopus_ostralegus", data_ trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="human","Homo_sapiens", data_trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="housesparrow","Passer_domesticus", data_trans 2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="bluetits","Parus_caeruleus", data_trans2$anim al) # Here I had to change this for a synonym.
data_trans2$animal <- ifelse(data_trans2$species=="blackbrowedalbatross","Thalassarche_melanophr ys", data_trans2$animal) # here this is a synonym (replace the i by y)
data_trans2$animal <- ifelse(data_trans2$species=="yellowbelliedmarmots","Marmota_flaviventris", data_trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="greattits","Parus_major", data_trans2$animal)
data_trans2$animal <- ifelse(data_trans2$species=="redbilledgull","Larus_novaehollandiae", data_
```

```
trans2$animal)

data_trans2$species <- data_trans2$animal


# Data set of individual data to be rotated in the pPCA
Xi <- data_trans2[,c("age_first_repro", "breed_freq", "fecundity", "lifetime_adult", "animal")]


# Scale Xi according to species means and SD
mean_afr <- mean(log(table_summary$mean_primiparity))
mean_breed <- mean(log(table_summary$mean_breedingfreq))
mean_fec <- mean(log(table_summary$mean_fecundity + 1))
mean_life <- mean(log(table_summary$mean_adultlife))

sd_afr <- sd(log(table_summary$mean_primiparity))
sd_breed <- sd(log(table_summary$mean_breedingfreq))
sd_fec <- sd(log(table_summary$mean_fecundity + 1))
sd_life <- sd(log(table_summary$mean_adultlife))

Xi$age_first_repro <- (Xi$age_first_repro - mean_afr)/sd_afr
Xi$breed_freq <- (Xi$breed_freq - mean_breed)/sd_breed
Xi$fecundity <- (Xi$fecundity - mean_fec)/sd_fec
Xi$lifetime_adult <- (Xi$lifetime_adult - mean_life)/sd_life

# Get the species in the same order as in the original dataset
Xi$animal <- factor(Xi$animal, levels=data_trans$animal)
Xi <- Xi[order(Xi$animal),]

# transform into matrix format
Xi2 <- as.matrix(Xi[, c(1,4,2,3)])
row.names(Xi2) <- as.factor(Xi$animal)

# Compute the individual scores to be put in the ppca
individual_scores <- scores(ppca,newdata=Xi2)

Si <- as.data.frame(individual_scores)
Si$species <- as.factor(Xi$animal)

# Figure
par(bty="n")
plot(Si$PC1, -Si$PC2, type="n", xlim=c(-8, 6), ylim=c(-4,8), main="", xlab="PC1 = 77%", ylab="PC
2 = 17%")
with(Si, dataEllipse(PC1, -PC2, species,
                           xlim=c(-8, 6), center.pch="", pch=16, plot.points=FALSE,
                           ylim=c(-4,8), level=.95, fill=TRUE, fill.alpha=0.1, col=colors))

g3 <- data.frame(ppca$L)
g3 <- g3[,c(1:2)]
g3[,2] <- g3[,2]*-1
len <- 5.5
off_factor <-0
```

```
arrows(0, 0, len * g3[, 1],  len * g3[, 2], length = 0.05, col = c(col_afr, col_life, col_breed,
col_fec), lwd=10)
```




```
# Calculate the proportion of variance explained by each axis (G. Blanchet)
# Build result object
varPCAaxis <- matrix(NA,
                     nrow = length(unique(Si$species)),
                     ncol = 4)

colnames(varPCAaxis) <- paste0("PC",1:4)
rownames(varPCAaxis) <- unique(Si$species)

# Calculate the amount of individual variance
for(i in 1:length(unique(Si$species))){
  varPCAaxis[i,] <- apply(Si[which(Si$species == unique(Si$species)[i]),1:4],2,var)
}

# Calculate the proportion of variance associated to each axis
varPCAaxisProp <- varPCAaxis / rowSums(varPCAaxis)

# Final presentation of the results
round(varPCAaxisProp,3)
```

```
##                             PC1   PC2   PC3   PC4
## Fulmarus_glacialoides     0.512 0.209 0.118 0.161
## Ovis_canadensis           0.300 0.143 0.191 0.366
## Thalassarche_melanophrys 0.404 0.140 0.111 0.344
## Parus_caeruleus           0.158 0.214 0.116 0.512
## Cinclus_cinclus           0.144 0.215 0.112 0.530
## Spermophilus_lateralis    0.124 0.189 0.145 0.542
## Parus_major               0.156 0.235 0.120 0.490
## Passer_domesticus         0.172 0.181 0.138 0.509
## Homo_sapiens              0.533 0.211 0.080 0.176
## Oreamnos_americanus       0.441 0.301 0.078 0.180
## Haematopus_ostralegus     0.338 0.208 0.142 0.312
## Larus_novaehollandiae     0.398 0.477 0.031 0.094
## Capreolus_capreolus       0.315 0.098 0.134 0.452
## Pagodroma_nivea           0.476 0.239 0.093 0.193
## Diomedea_exulans          0.623 0.204 0.088 0.085
## Leptonychotes_weddellii   0.546 0.170 0.111 0.172
## Marmota_flaviventris      0.203 0.193 0.129 0.475
```

Compare CV across species and within populations

```
traits <- c("age_first_repro", "lifetime_adult", "breed_freq", "fecundity")
species <- unique(data$species)

CV <- data.frame(
  species = rep(unique(data$species), each=length(traits)),
  trait = rep(traits, length(unique(data$species))),
  CV = rep(0, length(traits)*length(unique(data$species)))
)

for(j in 1:length(species)){
  for(i in 1:length(traits)){
    CV[which(CV$species == species[j] & CV$trait == traits[i]), "CV"] <- CV_fun(data[which(data
$species == species[j]), traits[i]])
  }
}

# Age at first reproduction
CV_fun(table_summary$mean_primiparity) # across species
```

```
## [1] 1.003706
```

```
mean(CV[which(CV$trait=="age_first_repro"), "CV"]) # Within populations
```

```
## [1] 0.2673112
```

```
# Adult lifespan
CV_fun(table_summary$mean_adultlife) # across species
```

```
## [1] 1.174491
```

```
mean(CV[which(CV$trait=="lifetime_adult"), "CV"]) # Within populations
```

```
## [1] 0.7224116
```

```
# Breeding frequency
CV_fun(table_summary$mean_breedingfreq) # across species
```

```
## [1] 0.1737395
```

```
mean(CV[which(CV$trait=="breed_freq"), "CV"]) # Within populations
```

```
## [1] 0.1440462
```

```
# Fecundity
CV_fun(table_summary$mean_fecundity) # across species
```

```
## [1] 0.6685311
```

```
mean(CV[which(CV$trait=="fecundity"), "CV"]) # Within populations
```

```
## [1] 0.675639
```

Species-specific PCAs

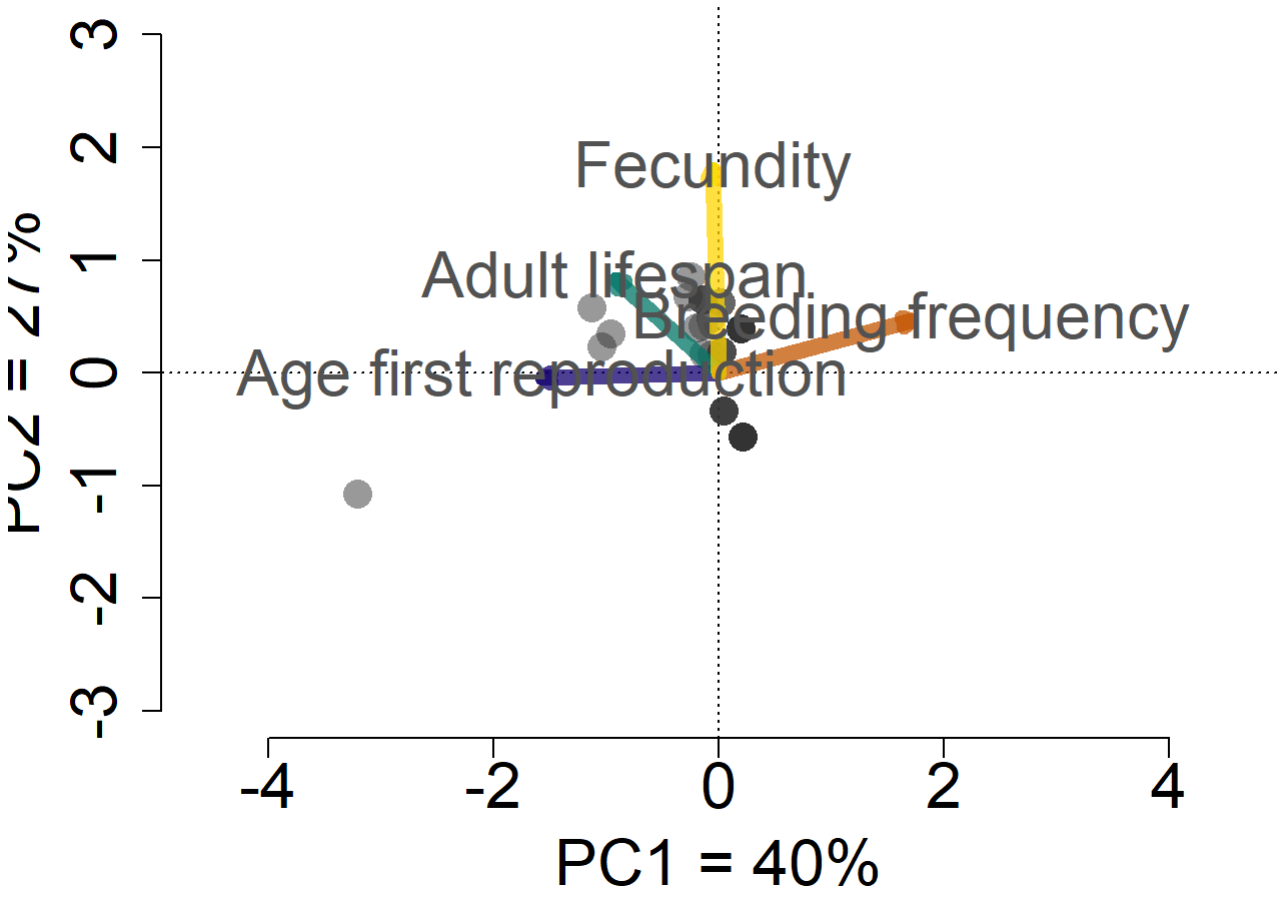
Roe deer

```
data_deer <- data[which(data$species == "roedeer"),]
data_deer$fec_one <- data_deer$fecundity +  1
test.pca_deer1 <- rda(log(data_deer[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_deer1)
```

```
##
## Call:
## rda(X = log(data_deer[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                           PC1   PC2    PC3     PC4
## Eigenvalue            1.616 1.080 0.9177 0.38621
## Proportion Explained  0.404 0.270 0.2294 0.09655
## Cumulative Proportion 0.404 0.674 0.9034 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  3.919476
##
##
## Species scores
##
##                      PC1      PC2      PC3     PC4
## age_first_repro  1.56529  0.04289 -0.92126 -0.7348
## lifetime_adult   0.91794 -0.83077  1.48237 -0.3322
## breed_freq      -1.70605 -0.46592 -0.06994 -0.8414
## fec_one          0.05525 -1.79970 -0.68814  0.3537
##
##
## Site scores (weighted sums of species scores)
##
##            PC1     PC2      PC3      PC4
## 1298  -0.19297 -0.3942 -0.45697  0.44848
## 2104  -0.19297 -0.3942 -0.45697  0.44848
## 3103  -0.21274  0.5695 -0.02328 -0.08114
## 4103  -0.19297 -0.3942 -0.45697  0.44848
## 5103   0.14289 -0.6480  0.60322 -0.18013
## 6103  -0.19297 -0.3942 -0.45697  0.44848
## 7103   1.12460 -0.5775 -1.16268 -2.06288
## 8103  -0.02291 -0.6245  0.02659  0.19100
## 9103  -0.19297 -0.3942 -0.45697  0.44848
## 10103  0.24382 -0.8536  0.85416 -0.29175
## 11103  0.07082 -0.4793  0.43544 -0.11346
## 1299  -0.19297 -0.3942 -0.45697  0.44848
## 1315  -0.21274  0.5695 -0.02328 -0.08114
## 1415   0.19100 -0.3985  0.90450 -0.44084
## 1515  -0.19297 -0.3942 -0.45697  0.44848
## 1615  -0.19297 -0.3942 -0.45697  0.44848
## 1715  -0.03181 -0.1912  0.22160 -0.04715
```

```
## 1815   0.95455 -0.3472 -1.64624 -1.80540
## 1914   0.13311 -0.1710  0.81786 -0.44225
## 2014  -0.02291 -0.6245  0.02659  0.19100
## 2114  -0.21274  0.5695 -0.02328 -0.08114
## 2214  -0.19297 -0.3942 -0.45697  0.44848
## 2314  -0.21274  0.5695 -0.02328 -0.08114
## 2414  -0.21274  0.5695 -0.02328 -0.08114
## 2514  -0.04269  0.3392  0.46028 -0.33862
## 2613  -0.21274  0.5695 -0.02328 -0.08114
## 2713  -0.19297 -0.3942 -0.45697  0.44848
## 2813  -0.04269  0.3392  0.46028 -0.33862
## 2913  -0.19297 -0.3942 -0.45697  0.44848
## 3013  -0.21274  0.5695 -0.02328 -0.08114
## 3113  -0.04269  0.3392  0.46028 -0.33862
## 3213  -0.21274  0.5695 -0.02328 -0.08114
## 3313  -0.21274  0.5695 -0.02328 -0.08114
## 3413  -0.21274  0.5695 -0.02328 -0.08114
## 3513  -0.21274  0.5695 -0.02328 -0.08114
## 3613  -0.21274  0.5695 -0.02328 -0.08114
## 3713  -0.21274  0.5695 -0.02328 -0.08114
## 3813  -0.21274  0.5695 -0.02328 -0.08114
## 3913   0.14289 -0.6480  0.60322 -0.18013
## 4013  -0.19297 -0.3942 -0.45697  0.44848
## 4113  -0.21274  0.5695 -0.02328 -0.08114
## 4213  -0.21274  0.5695 -0.02328 -0.08114
## 4313   1.03509 -0.2275  1.18151  1.01999
## 4413  -0.04269  0.3392  0.46028 -0.33862
## 4513  -0.21274  0.5695 -0.02328 -0.08114
## 4613  -0.21274  0.5695 -0.02328 -0.08114
## 4713   0.27691 -0.6743  1.06544 -0.47571
## 4813   0.06430 -0.1619  0.57826 -0.28788
## 4913  -0.21274  0.5695 -0.02328 -0.08114
## 5013  -0.03181 -0.1912  0.22160 -0.04715
## 5113   3.20587  1.0695 -0.30163  1.38742
## 5213  -0.19297 -0.3942 -0.45697  0.44848
## 5313   0.14289 -0.6480  0.60322 -0.18013
## 5413   0.13825 -0.4214  0.70517 -0.30463
## 5513  -0.19297 -0.3942 -0.45697  0.44848
## 5613  -0.19297 -0.3942 -0.45697  0.44848
## 5713  -0.03181 -0.1912  0.22160 -0.04715
## 5813  -0.19297 -0.3942 -0.45697  0.44848
## 5913  -0.21274  0.5695 -0.02328 -0.08114
## 6013  -0.21274  0.5695 -0.02328 -0.08114
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_deer1_reverse <- test.pca_deer1
test.pca_deer1_reverse$CA$u <- -(test.pca_deer1_reverse$CA$u)
test.pca_deer1_reverse$CA$v <- -(test.pca_deer1_reverse$CA$v)
g <- vegan::scores(test.pca_deer1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_deer1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=c(-3.
5,3.5), main="", xlab="PC1 = 40%", ylab="PC2 = 27%", cex.axis=2, cex.lab=2)
with(data_deer, points(test.pca_deer1_reverse, display = "sites", col = col_points, scaling = sc
l, pch = 16, cex=2))
g <- vegan::scores(test.pca_deer1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```



```
# Test for proportion of variance explained per axe
sum_all_deer <- summary(test.pca_deer1)

prop_deer <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  fec = c(1:4)
)

for (i in 1:4) {
  for (j in 1:4){
    prop_deer[j,i+1] <- as.numeric(abs(sum_all_deer$species[i,j])/sum(abs(sum_all_deer$species
[i,])))
  }
}

prop_deer
```

```
##   PC       prim      adult      breed        fec
## 1  1 0.47952887 0.25761377 0.55331403 0.01907323
## 2  2 0.01314097 0.23314890 0.15111073 0.62128278
## 3  3 0.28223168 0.41601621 0.02268376 0.23755606
## 4  4 0.22509848 0.09322112 0.27289148 0.12208792
```

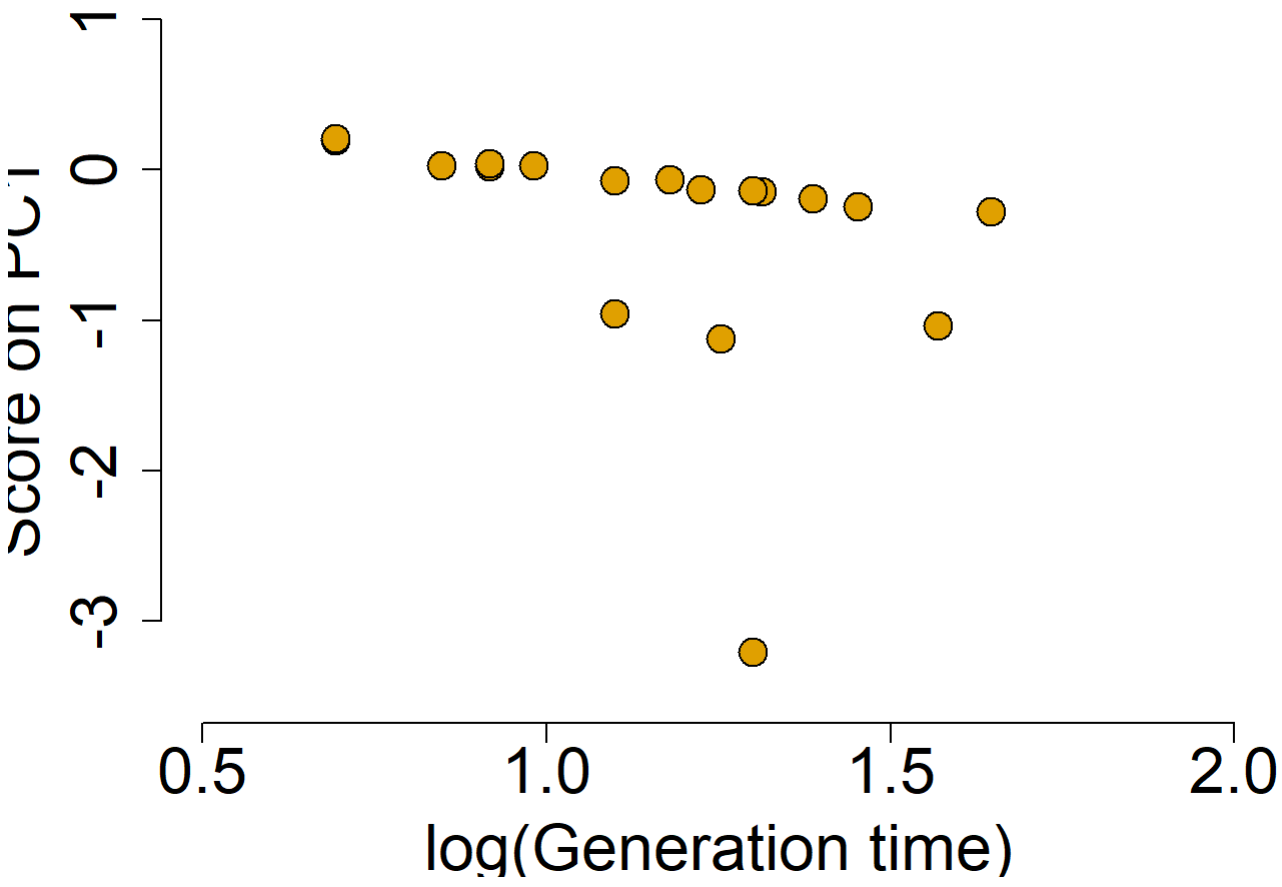
```
# Covariances
test <- as.matrix(scale(log(data_deer[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq    fec_one
## age_first_repro      1.00000000     0.07280684 -0.5227768 0.09982523
## lifetime_adult       0.07280684     1.00000000 -0.2612035 0.10631157
## breed_freq          -0.52277685    -0.26120353  1.0000000 0.12884032
## fec_one              0.09982523     0.10631157  0.1288403 1.00000000
```

```
# Correlation with generation time
individual_score_deer_reverse <- as.numeric(vegan::scores(test.pca_deer1_reverse)$sites[,1])
summary(lm(individual_score_deer_reverse ~ log(data_deer$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_deer_reverse ~ log(data_deer$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.72655 -0.00961  0.01017  0.09115  0.59150
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.9824     0.1817   5.407 1.26e-06 ***
## log(data_deer$generation_time)  -1.1250     0.1989  -5.657 4.98e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4132 on 58 degrees of freedom
## Multiple R-squared:  0.3555, Adjusted R-squared:  0.3444
## F-statistic:    32 on 1 and 58 DF,  p-value: 4.982e-07
```

```
par(bty="n")
plot(log(data_deer$generation_time), individual_score_deer_reverse, pch=21, xlab="log(Generation time)", ylab="Score on PC1", xlim=c(0.5,2), ylim=c(-3.5,1), bg=colors[13], cex=2, cex.axis=2, cex.lab=2)
```



Weddell seal

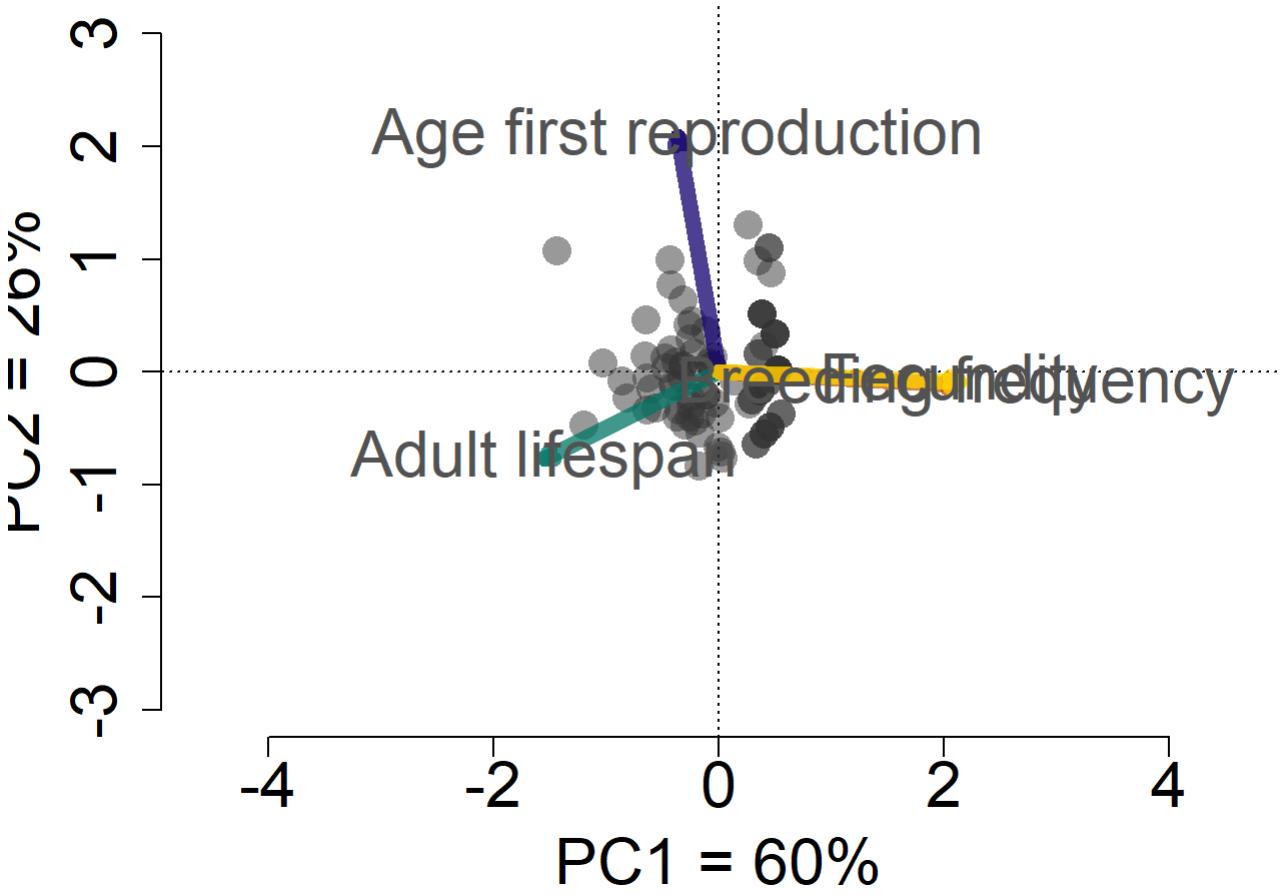
```
data_seal <- data[which(data$species == "weddellseal"),]
data_seal$fec_one <- data_seal$fecundity +  1
test.pca_seal1 <- rda(log(data_seal[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_seal1)
```

```
##
## Call:
## rda(X = log(data_seal[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3       PC4
## Eigenvalue            2.3971 1.0375 0.5627 0.0027231
## Proportion Explained  0.5993 0.2594 0.1407 0.0006808
## Cumulative Proportion 0.5993 0.8586 0.9993 1.0000000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  4.379877
##
##
## Species scores
##
##                     PC1      PC2    PC3        PC4
## age_first_repro  0.3643 -2.08827 0.5498  0.0004716
## lifetime_adult   1.5456  0.77056 1.3465  0.0036435
## breed_freq      -2.1079  0.11412 0.5772 -0.0797836
## fec_one         -2.1286  0.08909 0.5002  0.0817340
##
##
## Site scores (weighted sums of species scores)
##
##             PC1      PC2       PC3      PC4
## 1304   0.165885  0.54368 -0.537316 -0.67593
## 2107  -0.269828  0.28069  0.430703  0.48725
## 3106  -0.037224  0.76456  0.435566  0.20346
## 4106   0.318235 -0.63860  0.284304 -0.44804
## 5106   0.421061 -0.77530 -0.302908 -0.65835
## 6106   0.327339  0.05558  0.600207 -0.15527
## 7105   0.654859 -0.14645 -0.384104 -0.30620
## 8105  -0.398290  0.55387 -0.125507  0.24806
## 9105   1.031749 -0.07904 -0.378626  0.63072
## 10105 -0.501537 -0.34229 -0.361975 -0.01671
## 11105  0.241303 -0.45514 -0.052539 -0.59000
## 12101 -0.501537 -0.34229 -0.361975 -0.01671
## 1318   0.319083 -0.05710  0.177890 -0.40855
## 1418   0.051991 -0.13472  1.289042  0.62701
## 1518   0.479940 -0.12695 -0.193964 -0.49844
## 1618   0.037737  0.27472  0.204776 -0.18562
## 1718   0.637464  0.33354  0.030828 -0.22935
```

```
## 1818  -0.134429  0.08057  1.000370  0.74508
## 1917   0.091270 -0.08390  0.226963 -0.29007
## 2017   0.173887  0.83358  0.557965  0.06561
## 2117   0.352379  0.33734  0.234252 -0.31631
## 2217  -0.444304 -1.10028  0.005911  0.04850
## 2317  -0.325178  0.63809  0.145813  0.39977
## 2417   0.554411  0.31492  0.015198 -0.32076
## 2517  -0.555529  0.37276 -0.709023 -0.07823
## 2616  -0.398290  0.55387 -0.125507  0.24806
## 2716   1.199449  0.46820 -1.511193  1.95636
## 2816   0.384501 -0.08848  0.015384 -0.47845
## 2916   0.411557  0.11547  0.771818 -0.06963
## 3016   1.438815 -1.07739 -0.279173  2.33469
## 3116   0.604029  0.15109 -0.639938 -0.38854
## 3216   0.637179  0.05417  0.389552 -0.17215
## 3316   0.297857  0.46861  0.768719  0.04426
## 3416   0.812536  0.23408 -0.463237  0.04101
## 3516   0.247418  0.29697  0.150498 -0.35285
## 3616  -0.444304 -1.10028  0.005911  0.04850
## 3716   0.252278  0.40039  0.539900 -0.09334
## 3816   0.650191 -0.46028 -0.343213 -0.33594
## 3916   0.253173  0.22307 -0.133905 -0.52217
## 4016   0.112696 -0.36767  0.364691 -0.26566
## 4116   0.319083 -0.05710  0.177890 -0.40855
## 4216  -0.526273 -0.01470 -0.520970 -0.04489
## 4316   0.062473 -0.05287  0.363772 -0.15743
## 4416   0.212654  0.43581  0.700572  0.05477
## 4516   0.273241 -0.41836  0.065981 -0.52372
## 4616   0.149683  0.37420  0.508360 -0.04325
## 4716  -0.369034  0.16642  0.062545  0.28139
## 4816  -0.295922  0.25063  0.333865  0.43311
## 4916  -0.461210 -0.87637 -0.102761  0.02924
## 5016   0.470202 -0.03353  0.167256 -0.37325
## 5116  -0.526273 -0.01470 -0.520970 -0.04489
## 5216  -0.009780  0.40514  0.731236  0.34194
## 5316   0.223386  0.02675  0.559557 -0.13342
## 5416   0.368255  0.39852  0.456034 -0.18956
## 5516   0.397173  0.13380 -0.568318 -0.64705
## 5616  -0.325178  0.63809  0.145813  0.39977
## 5716  -0.021807  0.71091  0.221724 -0.01191
## 5816  -0.344298 -0.16117  0.221541  0.30958
## 5916  -0.257809 -1.30662  0.777479  0.40813
## 6016  -0.345097 -0.98600  0.374069  0.25437
## 6115   0.258790 -0.29151  0.557126 -0.21554
## 6215   0.219876 -0.17137 -0.190268 -0.61441
## 6315  -0.456322  0.48703 -0.340865  0.12763
## 6415  -0.344298 -0.16117  0.221541  0.30958
## 6514   0.862229  0.08178 -1.074922  0.30209
## 6614   0.437967 -0.99921 -0.194236 -0.63909
## 6714  -0.526273 -0.01470 -0.520970 -0.04489
## 6814   0.421908 -0.19379 -0.409322 -0.61886
## 6914  -0.427066  0.09957 -0.152813  0.16097
```

```
## 7013   0.062473 -0.05287  0.363772 -0.15743
## 7113  -0.380904 -0.51179  0.143912  0.21357
## 7213  -0.456322  0.48703 -0.340865  0.12763
## 7313   0.113421  0.20558 -0.107756 -0.47400
## 7413  -0.295922  0.25063  0.333865  0.43311
## 7513  -0.526273 -0.01470 -0.520970 -0.04489
## 7613  -0.456322  0.48703 -0.340865  0.12763
## 7713  -0.380904 -0.51179  0.143912  0.21357
## 7813   0.008482  0.66218  0.016724 -0.21895
## 7913  -0.526273 -0.01470 -0.520970 -0.04489
## 8013  -0.501537 -0.34229 -0.361975 -0.01671
## 8113  -0.501537 -0.34229 -0.361975 -0.01671
## 8212   0.113421  0.20558 -0.107756 -0.47400
## 8313  -0.380904 -0.51179  0.143912  0.21357
## 8413  -0.380904 -0.51179  0.143912  0.21357
## 8512  -0.526273 -0.01470 -0.520970 -0.04489
## 8613  -0.526273 -0.01470 -0.520970 -0.04489
## 8712  -0.402331 -0.22802  0.006183  0.18915
## 8813  -0.526273 -0.01470 -0.520970 -0.04489
## 8913  -0.555529  0.37276 -0.709023 -0.07823
## 9013  -0.369034  0.16642  0.062545  0.28139
## 9113  -0.427066  0.09957 -0.152813  0.16097
## 9212  -0.398290  0.55387 -0.125507  0.24806
## 9312  -0.369034  0.16642  0.062545  0.28139
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_seal1_reverse <- test.pca_seal1
test.pca_seal1_reverse$CA$u <- -(test.pca_seal1_reverse$CA$u)
test.pca_seal1_reverse$CA$v <- -(test.pca_seal1_reverse$CA$v)
g <- vegan::scores(test.pca_seal1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_seal1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=c(-3.
5,3.5), main="", xlab="PC1 = 60%", ylab="PC2 = 26%", cex.axis=2, cex.lab=2)
with(data_seal, points(test.pca_seal1_reverse, display = "sites", col = col_points, scaling = sc
l, pch = 16, cex=2))
g <- vegan::scores(test.pca_seal1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_seal <- summary(test.pca_seal1)

prop_seal <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_seal[j,i+1] <- as.numeric(abs(sum_all_seal$species[i,j])/sum(abs(sum_all_seal$species
[i,])))
  }
}

prop_seal
```

```
##   PC         prim        adult      breed       freq
## 1  1 0.1213233197 0.4215642634 0.73216319 0.76030699
## 2  2 0.6954407808 0.2101709692 0.03963798 0.03182304
## 3  3 0.1830788575 0.3672710027 0.20048670 0.17867584
## 4  4 0.0001570421 0.0009937648 0.02771212 0.02919413
```

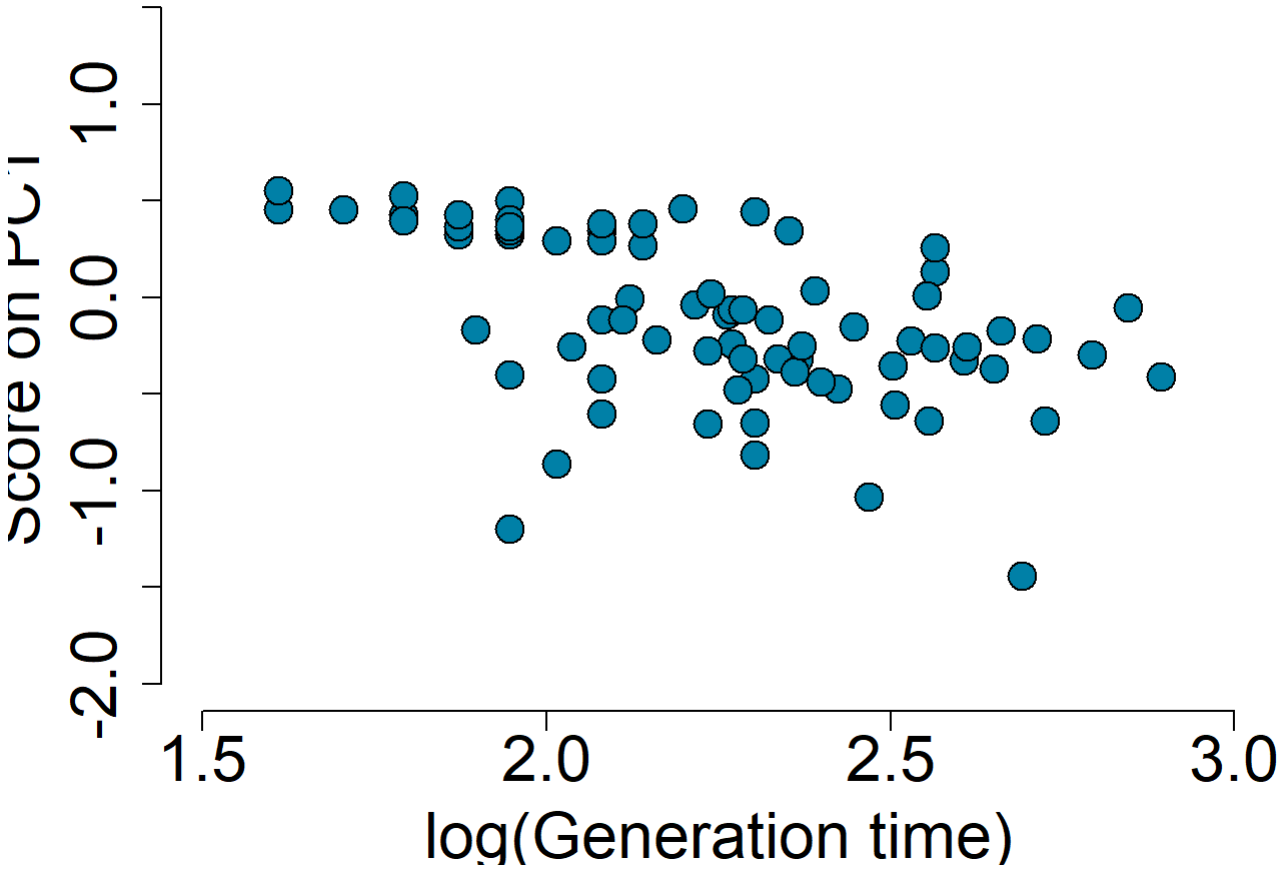
```
# Covariances
test <- as.matrix(scale(log(data_seal[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq    fec_one
## age_first_repro      1.00000000    -0.06376304 -0.1436586 -0.1431420
## lifetime_adult      -0.06376304     1.00000000 -0.4989979 -0.5311788
## breed_freq          -0.14365862    -0.49899789  1.0000000  0.9965525
## fec_one             -0.14314203    -0.53117878  0.9965525  1.0000000
```

```
# Correlation with generation time
individual_score_seal_reverse <- as.numeric(vegan::scores(test.pca_seal1_reverse)$sites[,1])
summary(lm(individual_score_seal_reverse ~ log(data_seal$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_seal_reverse ~ log(data_seal$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.40388 -0.17364  0.06127  0.21145  0.60950
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      1.9526     0.2642   7.391 6.85e-11 ***
## log(data_seal$generation_time)  -0.8984     0.1203  -7.466 4.80e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3616 on 91 degrees of freedom
## Multiple R-squared:  0.3799, Adjusted R-squared:  0.3731
## F-statistic: 55.75 on 1 and 91 DF,  p-value: 4.804e-11
```

```
par(bty="n")
plot(log(data_seal$generation_time), individual_score_seal_reverse, pch=21, xlab="log(Generation
time)", ylab="Score on PC1", xlim=c(1.5,3), ylim=c(-2,1.5), bg=colors[16], cex=2, cex.axis=2, ce
x.lab=2)
```



Golden-mantled ground squirrel

```
data_squirrels <- data[which(data$species == "goldenmantledgroundsquirrel"),]
data_squirrels$fec_one <- data_squirrels$fecundity +  1
test.pca_squirrels1 <- rda(log(data_squirrels[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_squirrels1)
```

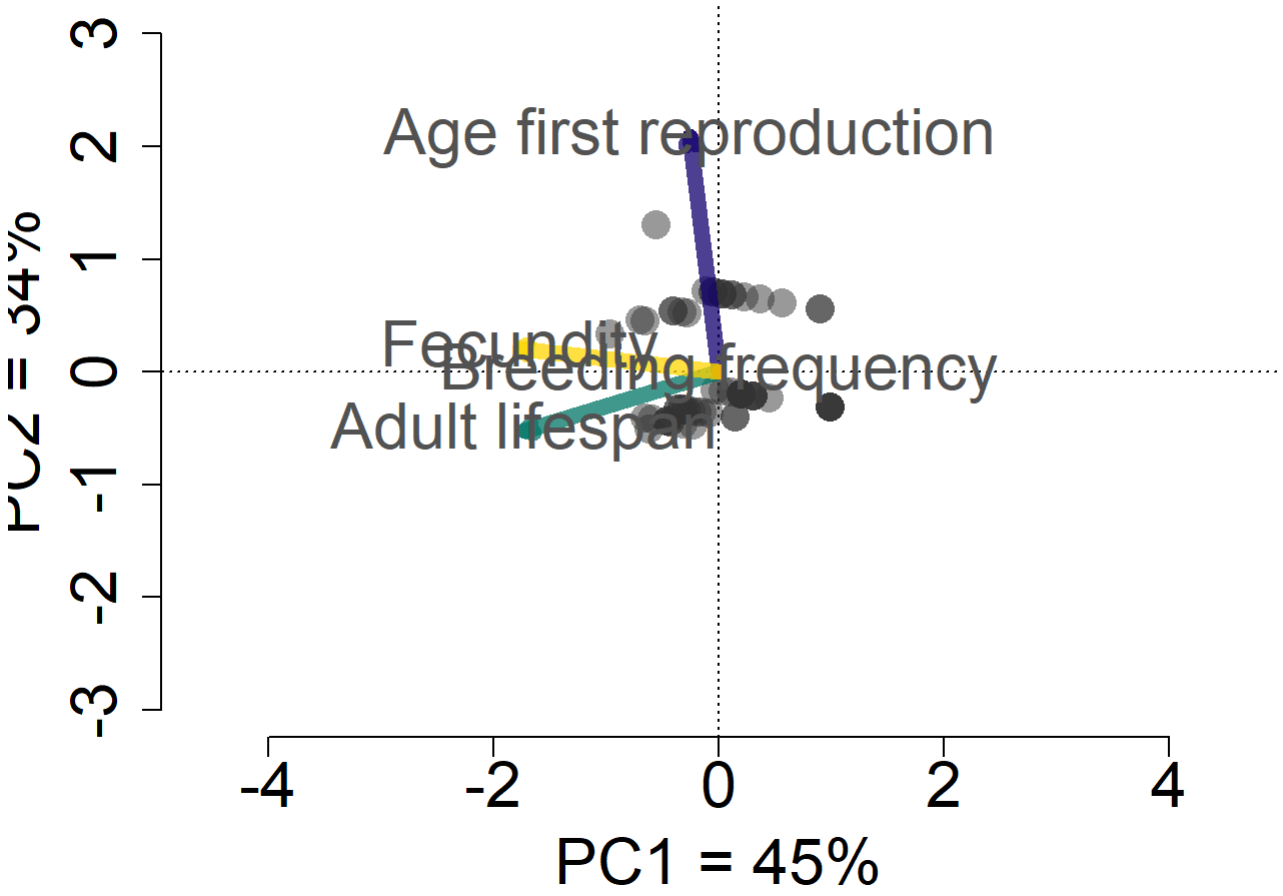
```
##
## Call:
## rda(X = log(data_squirrels[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               3          1
## Unconstrained       3          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                           PC1    PC2    PC3
## Eigenvalue            1.347 1.0180 0.6349
## Proportion Explained  0.449 0.3393 0.2116
## Cumulative Proportion 0.449 0.7884 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  3.707793
##
##
## Species scores
##
##                     PC1     PC2     PC3
## age_first_repro 0.2574 -2.0863  0.4043
## lifetime_adult  1.7239  0.5204  1.1576
## breed_freq      0.0000  0.0000  0.0000
## fec_one         1.7706 -0.2033 -1.1858
##
##
## Site scores (weighted sums of species scores)
##
##            PC1     PC2      PC3
## 1293   0.69904 -0.4609  0.35430
## 2101   0.23207  0.4732  0.62979
## 3101  -0.44682  0.2304 -0.19093
## 4101  -0.19717  0.1925 -0.54566
## 5101   0.11416 -0.7180 -0.60001
## 6101   0.04890 -0.7081 -0.50728
## 7101  -0.22459 -0.6665 -0.11866
## 8101  -0.90210 -0.5635  0.84405
## 9101   0.04890 -0.7081 -0.50728
## 10101  0.40853 -0.5444  0.10816
## 11101 -0.14008  0.4021  0.49966
## 1294   0.55978 -1.3029  0.94023
## 1312  -0.11554 -0.6831 -0.27362
## 1412  -0.36519 -0.6451  0.08112
## 1512  -0.56335 -0.6150  0.36270
## 1612   0.40853 -0.5444  0.10816
## 1712  -0.02643 -0.6966 -0.40023
```

```
## 1812   0.32689 -0.5320  0.22417
## 1911   0.46177  0.4383  0.30340
## 2011   0.28778  0.3371 -0.10830
## 2111  -0.19717  0.1925 -0.54566
## 2211  -0.30623  0.2091 -0.39070
## 2311  -0.98374  0.3120  0.57200
## 2411   0.28778  0.3371 -0.10830
## 2511   0.43023  0.4431  0.34822
## 2611   0.32690  0.3311 -0.16388
## 2711   0.59467  0.4181  0.11456
## 2811   0.32690  0.3311 -0.16388
## 2911  -0.11554 -0.6831 -0.27362
## 3011   0.36312  0.3256 -0.21535
## 3111   0.46177  0.4383  0.30340
## 3211  -0.30623  0.2091 -0.39070
## 3311  -0.02643 -0.6966 -0.40023
## 3411  -0.19717  0.1925 -0.54566
## 3511   0.19868  0.3506  0.01831
## 3611  -0.19717  0.1925 -0.54566
## 3711  -0.02643 -0.6966 -0.40023
## 3811  -0.19717  0.1925 -0.54566
## 3911  -0.19717  0.1925 -0.54566
## 4011  -0.98374  0.3120  0.57200
## 4111   0.32118  0.4597  0.50318
## 4211   0.65993  0.4082  0.02183
## 4311  -0.90210 -0.5635  0.84405
## 4411   0.96803 -0.3409  0.80224
## 4511   0.61837  0.5051  0.54841
## 4611  -0.30623  0.2091 -0.39070
## 4711   0.24526  0.3435 -0.04788
## 4811   0.28031 -0.5249  0.29036
## 4911  -0.98374  0.3120  0.57200
## 5011   0.43023  0.4431  0.34822
## 5111   0.08962  0.3672  0.17327
## 5211   0.03253  0.1576 -0.87205
## 5311  -0.98374  0.3120  0.57200
## 5411   0.65246 -0.4538  0.42049
## 5511  -0.30623  0.2091 -0.39070
## 5611  -0.14008  0.4021  0.49966
## 5711  -0.98374  0.3120  0.57200
## 5811   0.36312  0.3256 -0.21535
## 5911  -0.19717  0.1925 -0.54566
## 6011   0.46177  0.4383  0.30340
## 6111  -0.10807  0.1789 -0.67228
## 6211   0.14718  0.3584  0.09148
## 6311  -0.03273  0.1675 -0.77932
## 6411  -0.19717  0.1925 -0.54566
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_squirrels1_reverse <- test.pca_squirrels1
test.pca_squirrels1_reverse$CA$u <- -(test.pca_squirrels1_reverse$CA$u)
test.pca_squirrels1_reverse$CA$v <- -(test.pca_squirrels1_reverse$CA$v)
g <- vegan::scores(test.pca_squirrels1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_squirrels1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=
c(-3.5,3.5), main="", xlab="PC1 = 45%", ylab="PC2 = 34%", cex.axis=2, cex.lab=2)
with(data_squirrels, points(test.pca_squirrels1_reverse, display = "sites", col = col_points, sc
aling = scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_squirrels1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
```

```
## Warning in arrows(0, 0, len * g[, 1], len * g[, 2], length = 0.05, col =
## c(col_afr, : zero-length arrow is of indeterminate angle and so skipped
```

```
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_squirrels <- summary(test.pca_squirrels1)

prop_squirrels <- data.frame(
  PC = c(1:3),
  prim = c(1:3),
  adult = c(1:3),
  breed = c(1:3),
  freq = c(1:3)
)

for (i in 1:4) {
  for (j in 1:3){
    prop_squirrels[j,i+1] <- as.numeric(abs(sum_all_squirrels$species[i,j])/sum(abs(sum_all_squi
rrels$species[i,])))
  }
}

prop_squirrels
```

```
##   PC       prim     adult breed       freq
## 1  1 0.09367063 0.5067541   NaN 0.56037105
## 2  2 0.75920747 0.1529744   NaN 0.06435582
## 3  3 0.14712191 0.3402715   NaN 0.37527313
```

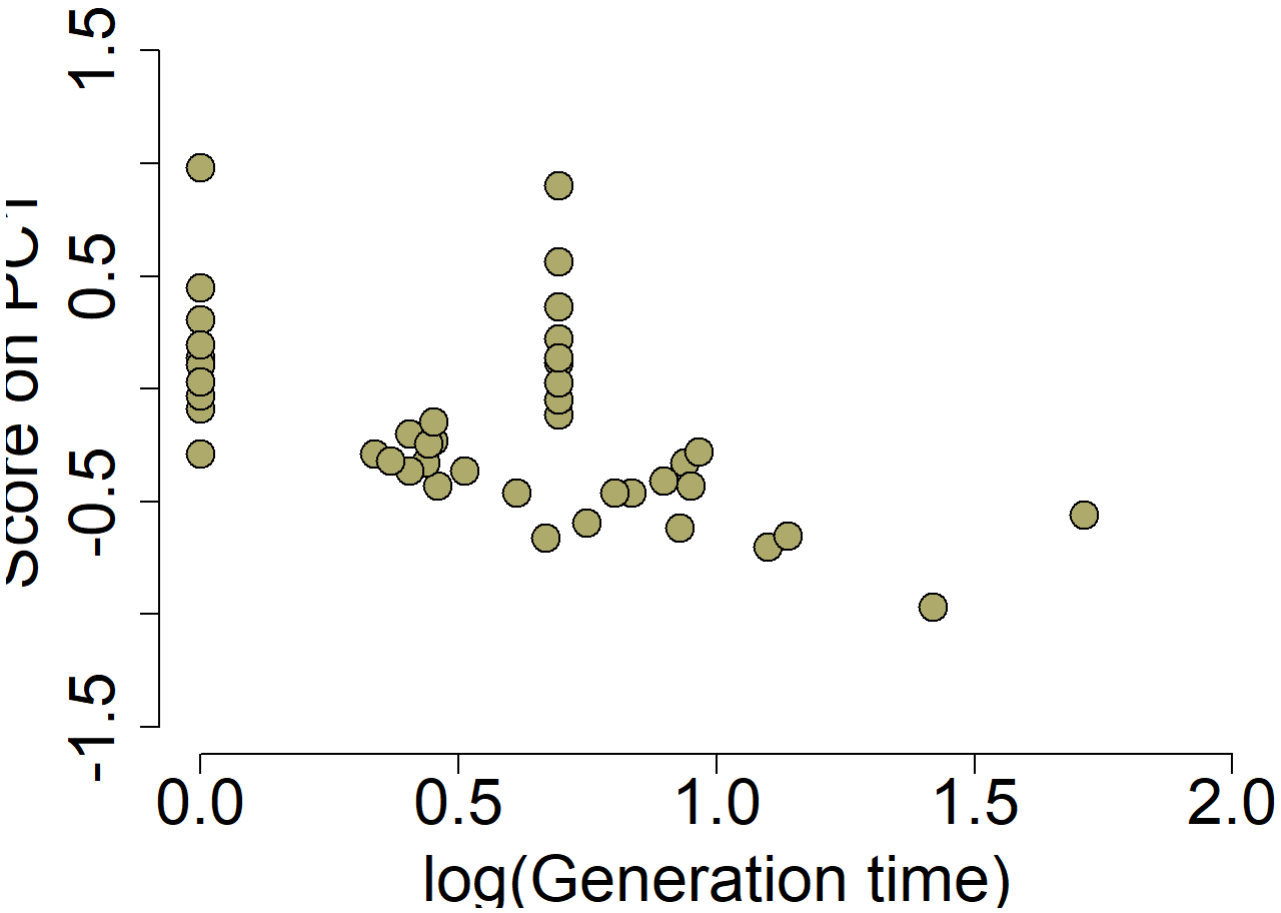
```
# Covariances
test <- as.matrix(scale(log(data_squirrels[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq    fec_one
## age_first_repro      1.00000000    -0.03796442         NA 0.08742549
## lifetime_adult      -0.03796442     1.00000000         NA 0.34347277
## breed_freq                   NA             NA         NA         NA
## fec_one              0.08742549     0.34347277         NA 1.00000000
```

```
# Correlation with generation time
individual_score_squirrels_reverse <- as.numeric(vegan::scores(test.pca_squirrels1_reverse)$site
s[,1])
summary(lm(individual_score_squirrels_reverse ~ log(data_squirrels$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_squirrels_reverse ~ log(data_squirrels$generation_time))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5871 -0.2682 -0.1022  0.1847  1.0604
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.29934    0.07053   4.244 7.46e-05 ***
## log(data_squirrels$generation_time) -0.66021    0.11489  -5.746 2.97e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3804 on 62 degrees of freedom
## Multiple R-squared:  0.3475, Adjusted R-squared:  0.337
## F-statistic: 33.02 on 1 and 62 DF,  p-value: 2.974e-07
```

```
par(bty="n")
plot(log(data_squirrels$generation_time), individual_score_squirrels_reverse, pch=21, xlab="log
(Generation time)", ylab="Score on PC1", xlim=c(0,2), ylim=c(-1.5,1.5), bg=colors[6], cex=2, ce
x.axis=2, cex.lab=2)
```



Bighorn sheep

```
data_sheep <- data[which(data$species == "bighornsheep"),]
data_sheep$fec_one <- data_sheep$fecundity +  1
test.pca_sheep1 <- rda(log(data_sheep[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_sheep1)
```

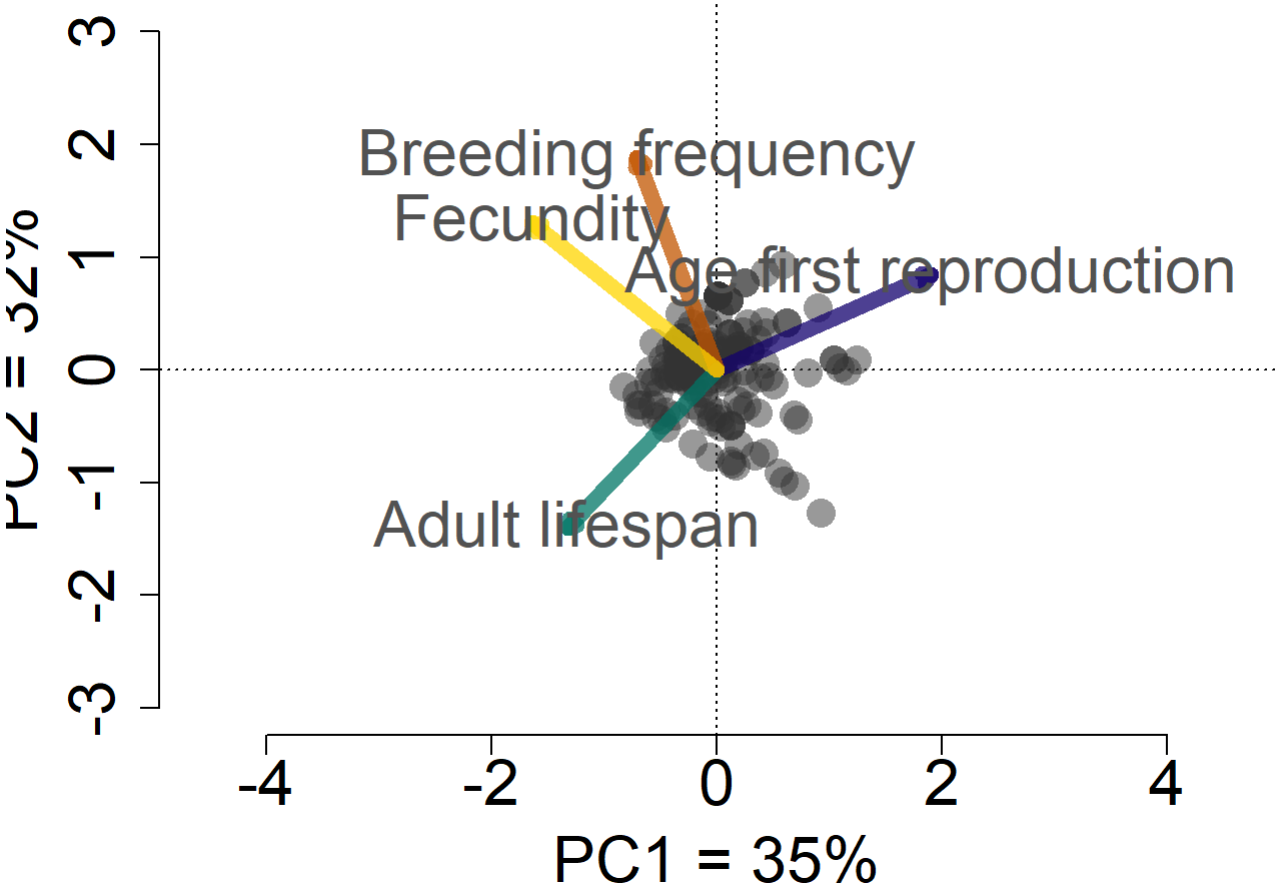
```
##
## Call:
## rda(X = log(data_sheep[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.3805 1.2769 0.7816 0.5610
## Proportion Explained  0.3451 0.3192 0.1954 0.1403
## Cumulative Proportion 0.3451 0.6643 0.8597 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  4.981902
##
##
## Species scores
##
##                     PC1     PC2     PC3     PC4
## age_first_repro  1.903  0.8447  0.7872 -1.1187
## lifetime_adult  -1.325 -1.4038  1.4292 -0.6598
## breed_freq      -0.706  1.8808  1.2554  0.7701
## fec_one         -1.640  1.3045 -0.7818 -1.0959
##
##
## Site scores (weighted sums of species scores)
##
##           PC1       PC2       PC3       PC4
## 1   -0.340652  0.020521  0.224293 -0.151580
## 2   -0.358280  0.243806 -0.075674 -0.224049
## 3    0.040524 -0.508740  0.277606  0.134585
## 4   -0.702574 -0.311992  0.219438  0.336625
## 5   -0.693030 -0.372255 -0.157806  0.041883
## 6    0.128481 -0.500661 -0.098662  0.025497
## 7   -0.304921  0.032731  0.195562 -0.101809
## 8   -0.345234 -0.049825  0.322202 -0.143591
## 9    0.172688 -0.849951 -0.675043 -0.568663
## 10  -0.331661  0.498793 -1.015902  0.710358
## 11  -0.085154 -0.108216  0.314821  0.249457
## 12  -0.344779  0.062452 -0.413732  0.782321
## 13  -0.007264  0.224450 -0.167082  0.294004
## 14  -0.567389 -0.310998  0.172662  0.534374
## 15  -0.321227  0.286237 -0.146250 -0.178656
## 16  -0.211929  0.055180  0.133567  0.029673
## 17   0.459983 -0.064564  0.484792  0.365488
```

```
## 18   0.691167 -1.029865 -0.583406 -0.721908
## 19  -0.389159 -0.074870  0.371269 -0.202679
## 20  -0.215471 -0.309942  0.138605 -0.248505
## 21   0.295183  0.168034  0.221510  0.075562
## 22  -0.148131  0.063139  0.101231  0.121433
## 23   0.335361 -0.762373 -1.243233 -0.625706
## 24  -0.366292  0.085492  0.143900 -0.202702
## 25   0.055713  0.053095  0.046508  0.422028
## 26   0.804796 -0.026069 -0.096697  1.535486
## 27  -0.121966  0.205847 -0.103063  0.129928
## 28  -0.330167 -0.062779  0.334886 -0.118820
## 29   0.232206  0.339389  0.007920 -0.052463
## 30   0.175445  0.180057  0.245266 -0.102288
## 31  -0.542907 -0.415928 -0.363698  0.119343
## 32  -0.711612 -0.219621  0.095931  0.304089
## 33   0.005854  0.660790 -0.769252  0.222041
## 34  -0.148131  0.063139  0.101231  0.121433
## 35  -0.274769 -0.036119  0.279753 -0.043270
## 36   0.417049 -0.734036 -0.036594  0.383740
## 37  -0.081669 -0.319993 -0.275567 -0.319984
## 38  -0.340652  0.020521  0.224293 -0.151580
## 39  -0.451918 -0.374818  0.221299  0.716799
## 40   0.117504  0.320787  0.071939 -0.216539
## 41   1.158513 -0.004805  0.750220  0.427185
## 42  -0.358280  0.243806 -0.075674 -0.224049
## 43   0.361193  0.269210  0.381007 -0.371028
## 44  -0.554928  0.243120 -0.590637  0.436839
## 45  -0.822781 -0.154242  0.043714  0.127638
## 46   0.052834 -0.109633  0.270404  0.451815
## 47   0.245324  0.775730 -0.594250 -0.124425
## 48   0.010364  0.001164  0.132886  0.366473
## 49   0.127376 -0.485001 -0.280442 -0.092476
## 50   0.504865 -0.136722  0.888846 -0.075824
## 51   0.104458  0.614418 -0.325938 -0.296996
## 52  -0.121966  0.205847 -0.103063  0.129928
## 53  -0.051548 -0.465037  0.248666 -0.009372
## 54  -0.204891 -0.096194  0.338577  0.071608
## 55  -0.135230 -0.374802  0.095832 -0.191109
## 56   0.055713  0.053095  0.046508  0.422028
## 57  -0.262832  0.044536  0.165250 -0.042643
## 58  -0.229875 -0.149001  0.419312  0.046058
## 59   0.267153 -0.318267  0.135414 -0.399896
## 60   0.688354 -0.397623  0.144585 -0.484496
## 61  -0.167555 -0.202578  0.471773  0.148510
## 62  -0.121966  0.205847 -0.103063  0.129928
## 63  -0.262832  0.044536  0.165250 -0.042643
## 64  -0.595502 -0.004413 -0.237898  0.429146
## 65  -0.345234 -0.049825  0.322202 -0.143591
## 66   0.196579  0.214406 -0.221804  0.594599
## 67  -0.453374 -0.514619 -0.187713  0.320937
## 68   0.436049  0.329346 -0.046803  0.248133
## 69   1.089148  0.016712  0.482358  0.747709
```

```
## 70   0.005854  0.660790 -0.769252  0.222041
## 71   0.621797  0.418499  0.088939 -0.020607
## 72  -0.481463  0.102745  0.158957 -0.374957
## 73  -0.059067 -0.772288 -0.639071  0.479372
## 74  -0.081757  0.401176  0.028752 -0.525123
## 75   0.555407 -0.913150 -0.697689 -0.945095
## 76   0.060012  0.142203  0.335903 -0.263412
## 77  -0.204891 -0.096194  0.338577  0.071608
## 78   0.027541  0.170119  0.308569 -0.316793
## 79  -0.230532 -0.031222  0.258183  0.020485
## 80  -0.340652  0.020521  0.224293 -0.151580
## 81   0.027683 -0.433206 -0.039587 -0.053430
## 82   0.192483 -0.665804  0.223695  0.236496
## 83   0.194686  0.172870  0.568926 -0.594721
## 84   0.592563 -0.983493 -1.026719 -0.202871
## 85   0.187990 -0.271311  0.187518 -0.462412
## 86   0.211324 -0.356047  0.471297 -0.287014
## 87  -0.216384 -0.656313 -1.113255 -0.034300
## 88  -0.367725 -0.408367  0.238974  0.847097
## 89  -0.148131  0.063139  0.101231  0.121433
## 90  -0.321227  0.286237 -0.146250 -0.178656
## 91   0.237691 -0.010549  0.485474  0.028688
## 92  -0.041471 -0.416574  0.121559 -0.045086
## 93   0.196579  0.214406 -0.221804  0.594599
## 94   0.430943  0.051319  0.335793  0.298749
## 95   0.128481 -0.500661 -0.098662  0.025497
## 96  -0.459076 -0.042871  0.350922 -0.311748
## 97  -0.416745  0.176856  0.035686 -0.295672
## 98  -0.199786  0.181832 -0.044019  0.020991
## 99   1.044267  0.088870  0.078304  1.189020
## 100 -0.288997 -0.098173  0.369543 -0.051138
## 101  0.104458  0.614418 -0.325938 -0.296996
## 102  0.175445  0.180057  0.245266 -0.102288
## 103  0.005934 -0.380597 -0.382672 -0.292124
## 104 -0.600347 -0.117462 -0.081401  0.445674
## 105  0.431072  0.864883 -0.458509 -0.393165
## 106  0.125363 -0.809196 -0.229201 -0.304636
## 107  0.295183  0.168034  0.221510  0.075562
## 108 -0.423053 -0.073840  0.381246 -0.252527
## 109 -0.671860 -0.312101  0.209270  0.381623
## 110  0.134006 -0.835790 -0.403128 -0.432411
## 111 -0.262832  0.044536  0.165250 -0.042643
## 112 -0.487510 -0.442451 -0.435809  0.142787
## 113  0.272796  0.411433  0.477555 -0.956783
## 114 -0.064718  0.249435  0.230904 -0.468466
## 115 -0.549443 -0.106818 -0.113083  0.517990
## 116 -0.342356  0.112903  0.098307 -0.173378
## 117 -0.514928 -0.190897 -0.009495  0.586101
## 118 -0.114404 -0.212821  0.467949  0.228482
## 119  0.360601 -0.379376 -0.691603 -0.869083
## 120  0.582839  0.937727 -0.347600 -0.612742
## 121  0.117504  0.320787  0.071939 -0.216539
```

```
## 122  0.091340  0.178078  0.276232 -0.225034
## 123  0.385203 -0.072681  0.841313 -0.264431
## 124 -0.013033 -0.077415  0.661307 -0.324486
## 125  0.055189 -0.037807  0.584127 -0.232862
## 126  1.240915  0.089556  0.593267  0.528132
## 127  0.417953  0.428543  0.143661 -0.321203
## 128  0.062057  0.086039  0.412157 -0.248682
## 129  0.724027 -0.442974 -0.406291 -0.845723
## 130 -0.102885  0.227842  0.273308 -0.519844
## 131  0.901881  0.552932  0.293620 -0.425834
## 132 -0.101182  0.135460  0.399295 -0.498046
## 133 -0.211929  0.055180  0.133567  0.029673
## 134  0.265862 -0.127573  0.223413  0.767509
## 135 -0.065451  0.147670  0.370564 -0.448275
## 136  0.245324  0.775730 -0.594250 -0.124425
## 137 -0.450091  0.040321  0.233933 -0.315973
## 138  0.117504  0.320787  0.071939 -0.216539
## 139 -0.342356  0.112903  0.098307 -0.173378
## 140 -0.304921  0.032731  0.195562 -0.101809
## 141  0.022057  0.520057 -0.168985 -0.397944
## 142 -0.358280  0.243806 -0.075674 -0.224049
## 143 -0.275879  0.338168 -0.232627 -0.123101
## 144 -0.135012  0.499479 -0.500939  0.049470
## 145  0.005854  0.660790 -0.769252  0.222041
## 146  0.005854  0.660790 -0.769252  0.222041
## 147 -0.217414  0.405118 -0.343987 -0.051478
## 148  0.005854  0.660790 -0.769252  0.222041
## 149  0.089887 -0.067203  0.199829  0.497207
## 150  1.044267  0.088870  0.078304  1.189020
## 151  0.621797  0.418499  0.088939 -0.020607
## 152  0.924154 -1.268565 -0.747584  0.342258
## 153  0.104458  0.614418 -0.325938 -0.296996
## 154  0.005854  0.660790 -0.769252  0.222041
## 155  0.005854  0.660790 -0.769252  0.222041
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_sheep1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), xlim=c(-3.5,3.5), xlab="PC1 = 35%", ylab="PC2 = 32%", cex.lab=2, cex.axis=2)
with(data_sheep, points(test.pca_sheep1, display = "sites", col = col_points, scaling = scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_sheep1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, col_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```



```r
# Test for proportion of variance explained per axe
sum_all_sheep <- summary(test.pca_sheep1)

prop_sheep <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_sheep[j,i+1] <- as.numeric(abs(sum_all_sheep$species[i,j])/sum(abs(sum_all_sheep$specie
s[i,])))
  }
}

prop_sheep
```

```
##   PC      prim     adult     breed      freq
## 1  1 0.4088800 0.2750622 0.1530603 0.3401417
## 2  2 0.1815314 0.2913592 0.4077764 0.2704904
## 3  3 0.1691780 0.2966354 0.2721918 0.1621174
## 4  4 0.2404107 0.1369432 0.1669715 0.2272505
```

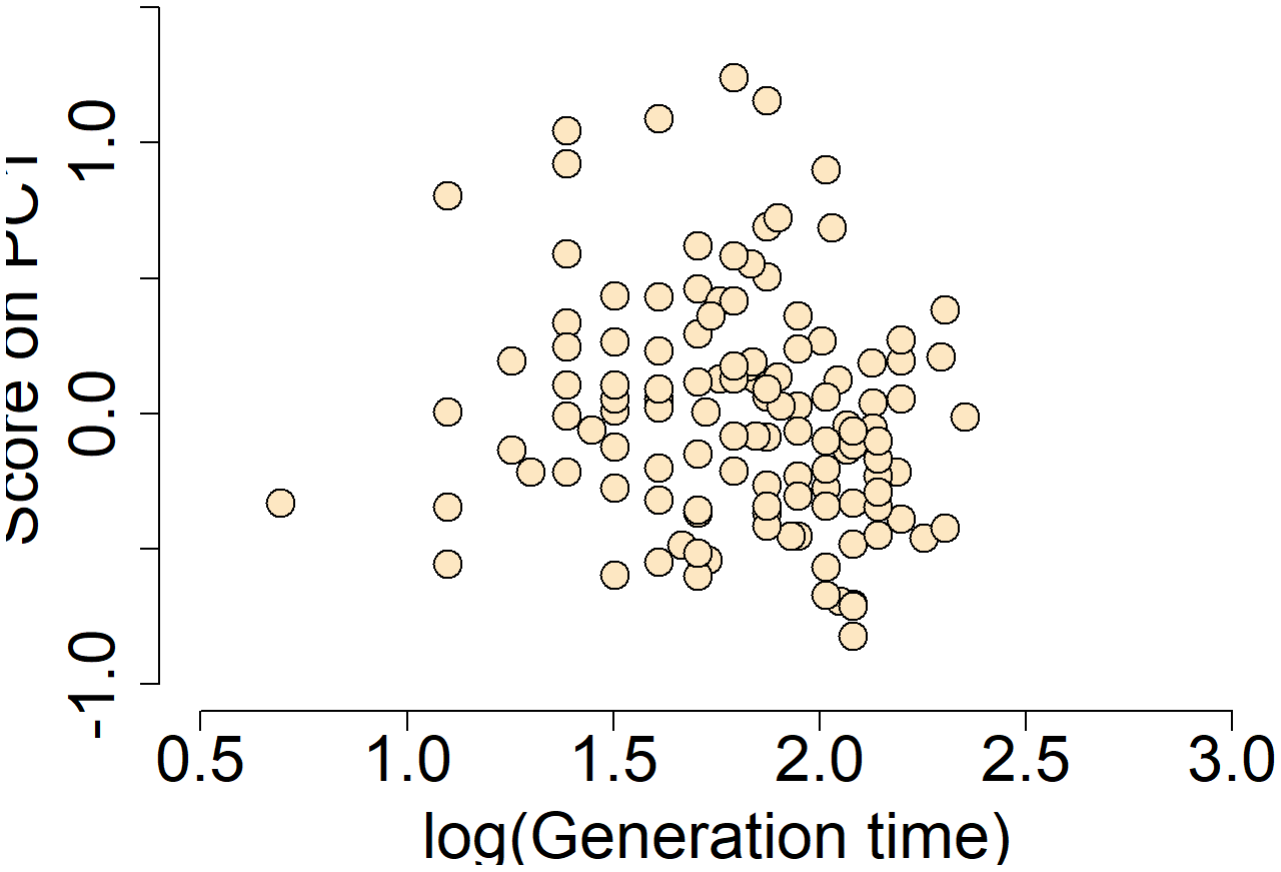
```r
# Covariances
test <- as.matrix(scale(log(data_sheep[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq      fec_one
## age_first_repro      1.00000000   -0.297196747  0.06000607 -0.227013494
## lifetime_adult      -0.29719675    1.000000000 -0.06744570 -0.008310028
## breed_freq           0.06000607   -0.067445704  1.00000000  0.287826653
## fec_one             -0.22701349   -0.008310028  0.28782665  1.000000000
```

```r
# Correlation with generation time
individual_score_sheep <- as.numeric(vegan::scores(test.pca_sheep1)$sites[,1])
summary(lm(individual_score_sheep ~ log(data_sheep$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_sheep ~ log(data_sheep$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.74895 -0.26196 -0.04879  0.18920  1.24825
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.4068     0.1805   2.254   0.0256 *
## log(data_sheep$generation_time)  -0.2311     0.1009  -2.290   0.0234 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.396 on 153 degrees of freedom
## Multiple R-squared:  0.03313,    Adjusted R-squared:  0.02681
## F-statistic: 5.243 on 1 and 153 DF,  p-value: 0.0234
```

```
par(bty="n")
plot(log(data_sheep$generation_time), individual_score_sheep, pch=21, xlab="log(Generation tim
e)", ylab="Score on PC1", xlim=c(0.5,3), ylim=c(-1,1.5), bg=colors[2], cex=2, cex.lab=2, cex.axi
s=2)
```



###

Mountain goat

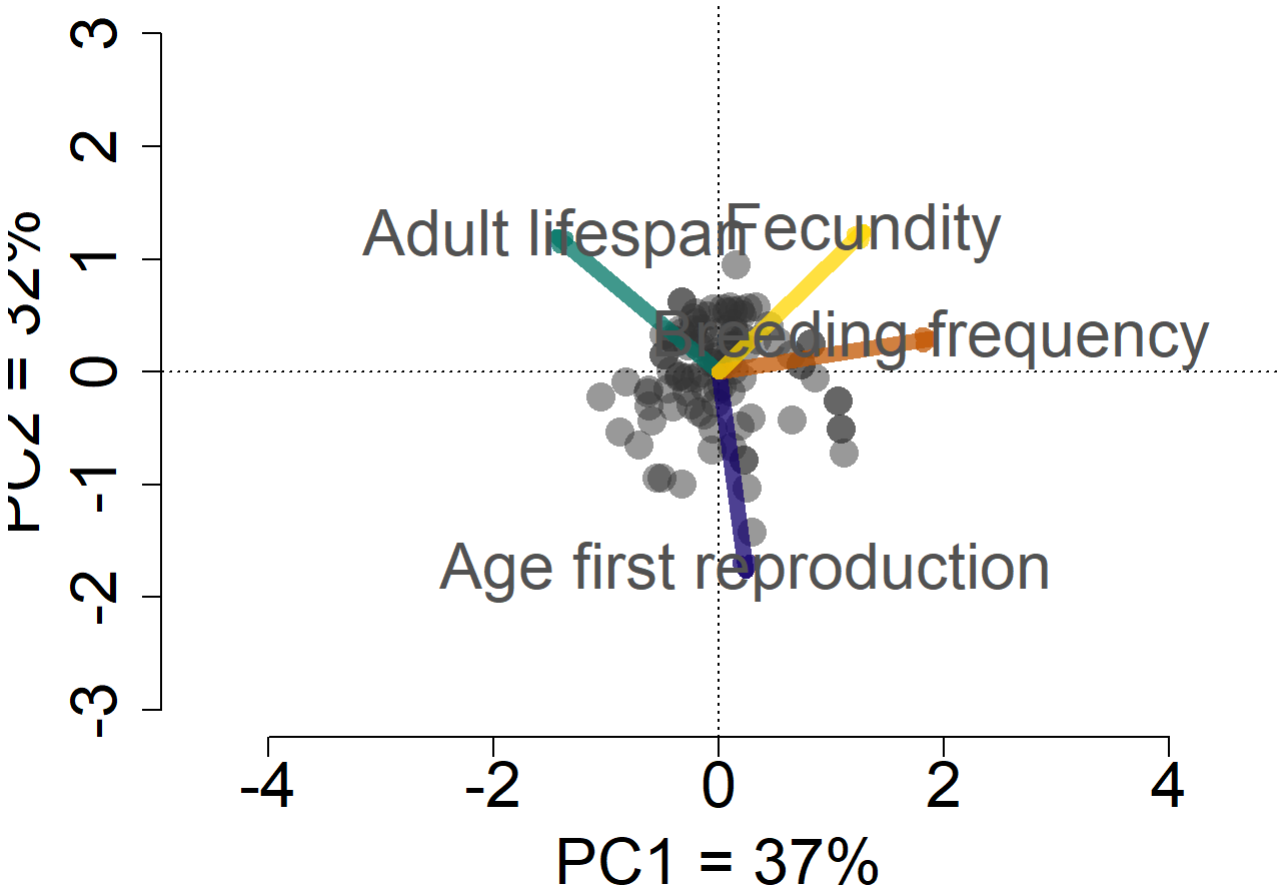
```
data_goats <- data[which(data$species == "mountaingoat"),]
data_goats$fec_one <- data_goats$fecundity +  1
test.pca_goats1 <- rda(log(data_goats[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_goats1)
```

```
##
## Call:
## rda(X = log(data_goats[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.4938 1.2603 0.7455 0.5004
## Proportion Explained  0.3735 0.3151 0.1864 0.1251
## Cumulative Proportion 0.3735 0.6885 0.8749 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  4.426728
##
##
## Species scores
##
##                     PC1     PC2     PC3     PC4
## age_first_repro  0.2423 -1.7623  1.2768 -0.3231
## lifetime_adult  -1.4406  1.1984  0.7831 -0.8801
## breed_freq       1.8822  0.2983 -0.3392 -1.0734
## fec_one          1.2813  1.2423  1.1373  0.6484
##
##
## Site scores (weighted sums of species scores)
##
##           PC1       PC2       PC3       PC4
## 156  0.128363  0.426638 -0.080740 -0.083423
## 157  0.201199  0.510349  0.048821  0.026620
## 158 -0.010280  0.062041  0.148658 -0.583623
## 159 -0.062487 -0.690739  0.012590  0.256342
## 160  1.111910 -0.716142  0.403883  0.548206
## 161  0.445390  0.410507 -0.173655 -0.124889
## 162 -0.113845  0.316379  0.587766 -0.313243
## 163 -0.052073  0.558360  0.097755 -0.231837
## 164  0.103432  0.229973  0.374310 -0.522582
## 165 -0.101272  0.501816  0.010240 -0.306169
## 166 -0.203795  0.438248 -0.051351 -0.279713
## 167  0.280675 -0.403860  0.095127 -0.725035
## 168 -0.039614  0.084932  0.364438  0.122338
## 169 -0.172413  0.224968  0.475161 -0.303562
## 170  0.161873  0.243022  0.417326 -0.379923
## 171 -0.331096  0.625571 -0.578501  0.763331
## 172 -0.283047 -0.173731  0.655151 -0.189803
```

```
## 173 -0.022504  0.137511  0.266653 -0.538137
## 174 -0.623692 -0.156251  0.140847  0.116258
## 175 -0.325740  0.349988 -0.098924 -0.077728
## 176  0.332969  0.582086  0.030368 -0.338820
## 177  0.521830  0.271042  0.428200 -0.219831
## 178  0.257926  0.571216 -0.001875 -0.463242
## 179  0.236406  0.206816  0.420615 -0.113518
## 180  0.851085 -0.053617  0.069549  0.380653
## 181  0.137948  0.366662  0.548665 -0.553240
## 182 -0.207620  0.528501  0.103368 -0.163424
## 183 -0.488522  0.326016 -0.079255  0.008694
## 184 -0.232533  0.477154  0.057647 -0.082712
## 185 -0.280296 -0.054665  0.039813 -0.579683
## 186  0.076594  0.094166 -0.301791  0.817758
## 187  1.058822 -0.258453 -0.156734  0.759516
## 188 -0.388522  0.277833 -0.210599 -0.172579
## 189  0.185641  0.555566 -0.039891 -0.582334
## 190  0.217039  0.306425  0.515455 -0.296576
## 191  0.095089  0.577691  0.079928 -0.297374
## 192  0.039660  0.561672  0.033631 -0.434540
## 193  0.068225  0.533506  0.002517 -0.382445
## 194 -0.454197 -0.152466  0.159140  0.295028
## 195 -0.596625 -0.436391  0.374420 -0.101687
## 196  0.122360  0.543832 -0.070530 -0.686880
## 197  0.114055 -0.667567  0.506587 -0.059238
## 198 -0.347672 -0.034366  0.197024 -0.119598
## 199  0.338212  0.287327 -0.364304 -0.286818
## 200  0.147866  0.955639 -0.505671 -0.390160
## 201 -0.489404  0.151067 -0.212653  0.435166
## 202 -0.822505 -0.088696 -0.486722  0.410070
## 203  0.025582 -0.124352  0.163918  0.520379
## 204  0.166033  0.254868 -0.176309  0.504136
## 205 -0.143654  0.378946 -0.116861 -0.170030
## 206 -0.177472 -0.357720 -0.197272  0.213600
## 207  0.185137 -0.474993 -1.424203 -0.432150
## 208 -0.347020  0.377806 -0.020420  0.064835
## 209 -0.229317  0.371733 -0.066152  0.005488
## 210  0.729567  0.066205  0.201916  0.159032
## 211 -0.349953 -0.043216  0.245637  0.119108
## 212 -0.408551 -0.305906 -0.293402 -0.622297
## 213 -0.273217  0.234368 -0.195725  0.209789
## 214  0.108487 -0.176847  0.631629  0.027877
## 215 -0.146770 -0.005042  0.172253 -0.226791
## 216 -0.420460  0.295123 -0.087705  0.194867
## 217  0.044514  0.374690 -0.043941  0.282515
## 218 -0.054270 -0.507746 -0.753279 -1.073118
## 219  0.249110 -1.026530 -0.748632 -0.686789
## 220 -0.331096  0.625571 -0.578501  0.763331
## 221 -0.073933  0.078668  0.301814 -0.116748
## 222 -0.009625  0.179181 -0.207875  0.660516
## 223 -0.010848 -0.163072  0.668216  0.007838
## 224 -0.503712 -0.943139  0.374673  0.459351
```

```
## 225  0.815879  0.249916 -0.302244  0.520790
## 226 -0.709923 -0.645636  0.626135 -0.324359
## 227  0.220343 -0.778525 -1.052410 -0.572288
## 228 -0.212679 -0.054188 -0.569065  0.353738
## 229 -0.619590 -0.298133  0.050888  0.537768
## 230 -0.881925 -0.531432  0.451761  0.508480
## 231  1.058822 -0.258453 -0.156734  0.759516
## 232 -0.625391 -0.188387  0.070642  0.012814
## 233  0.294499 -1.417851 -0.269307 -0.867457
## 234  0.729567  0.066205  0.201916  0.159032
## 235 -1.044399 -0.220375  0.266486  0.647098
## 236  0.643348  0.151220  0.295832  0.001790
## 237 -0.022600 -0.270156 -1.197920 -0.811013
## 238 -0.129068 -0.377204  0.950819 -0.069794
## 239 -0.171849  0.252119 -1.142306  0.691649
## 240 -0.426099  0.008758 -0.262624  1.061454
## 241 -0.545434 -0.937458  0.833990  0.242598
## 242  0.201240 -0.048665  0.195485  0.363998
## 243  0.220343 -0.778525 -1.052410 -0.572288
## 244  0.650628 -0.422163  1.151782 -0.415346
## 245  1.087589 -0.506458  0.147043  0.645015
## 246 -0.324268 -0.991604 -0.453065 -0.139164
## 247  0.134363  0.017278  0.268332  0.242032
## 248 -0.126460 -0.139203 -0.662981  0.510980
## 249 -0.244348 -0.291777 -0.124425  0.091634
## 250 -0.489404  0.151067 -0.212653  0.435166
## 251  0.815879  0.249916 -0.302244  0.520790
## 252  1.087589 -0.506458  0.147043  0.645015
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_goats1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), xlim=c(-
3.5,3.5), xlab="PC1 = 37%", ylab="PC2 = 32%", cex.axis=2, cex.lab=2)
with(data_goats, points(test.pca_goats1, display = "sites", col = col_points, scaling = scl, pch
= 16, cex=2))
g <- vegan::scores(test.pca_goats1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_goats <- summary(test.pca_goats1)

prop_goats <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_goats[j,i+1] <- as.numeric(abs(sum_all_goats$species[i,j])/sum(abs(sum_all_goats$specie
s[i,])))
  }
}

prop_goats
```

```
##   PC       prim     adult      breed      freq
## 1  1 0.06721900 0.3348530 0.52383179 0.2973203
## 2  2 0.48892196 0.2785597 0.08303177 0.2882878
## 3  3 0.35423277 0.1820186 0.09441277 0.2639201
## 4  4 0.08962628 0.2045687 0.29872367 0.1504719
```

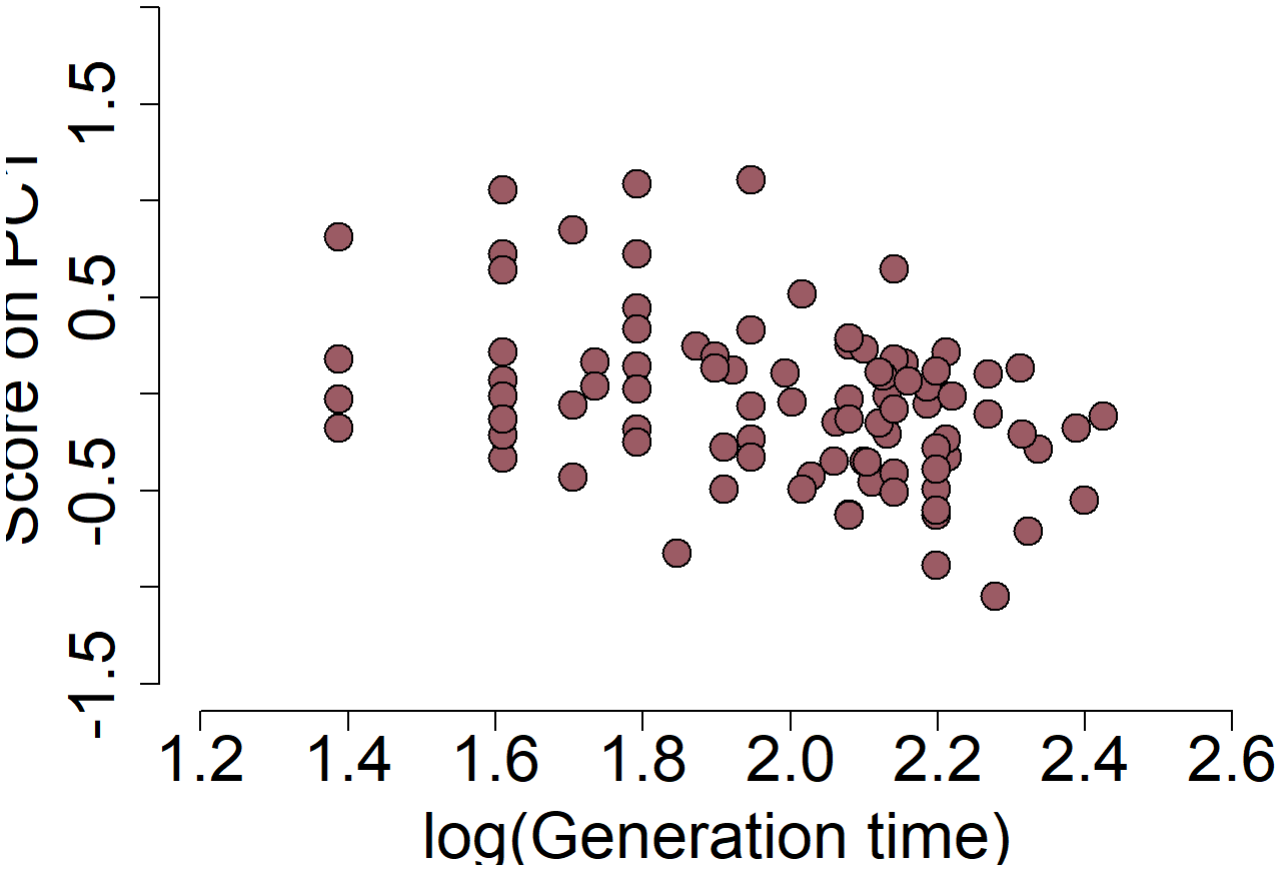
```
# Covariances
test <- as.matrix(scale(log(data_goats[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq      fec_one
## age_first_repro      1.00000000   -0.240212751 -0.03187032 -0.129874036
## lifetime_adult      -0.24021275    1.000000000 -0.34189148 -0.007556062
## breed_freq          -0.03187032   -0.341891477  1.00000000  0.347096568
## fec_one             -0.12987404   -0.007556062  0.34709657  1.000000000
```

```
# Correlation with generation time
individual_score_goats <- as.numeric(vegan::scores(test.pca_goats1)$sites[,1])
summary(lm(individual_score_goats ~ log(data_goats$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_goats ~ log(data_goats$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.91135 -0.30689 -0.01168  0.29717  1.09815
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      1.4738     0.3195   4.613 1.24e-05 ***
## log(data_goats$generation_time)  -0.7503     0.1613  -4.652 1.06e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4099 on 95 degrees of freedom
## Multiple R-squared:  0.1856, Adjusted R-squared:  0.177
## F-statistic: 21.64 on 1 and 95 DF,  p-value: 1.061e-05
```

```
par(bty="n")
plot(log(data_goats$generation_time), individual_score_goats, pch=21, xlab="log(Generation tim
e)", ylab="Score on PC1", xlim=c(1.2,2.6), ylim=c(-1.5,2), bg=colors[10], cex=2, cex.axis=2, ce
x.lab=2)
```



White-throated dipper

```
data_dipper <- data[which(data$species == "dipper"),]
data_dipper$fec_one <- data_dipper$fecundity +  1
test.pca_dipper1 <- rda(log(data_dipper[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_dipper1)
```

```
##
## Call:
## rda(X = log(data_dipper[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.3483 0.9836 0.9713 0.6968
## Proportion Explained  0.3371 0.2459 0.2428 0.1742
## Cumulative Proportion 0.3371 0.5830 0.8258 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  8.472156
##
##
## Species scores
##
##                     PC1     PC2    PC3     PC4
## age_first_repro  1.441 -1.9917  3.407  0.5415
## lifetime_adult   3.199  0.5414 -1.204  2.4427
## breed_freq      -1.839 -3.2584 -1.586  1.1961
## fec_one          2.915 -1.6653 -1.364 -2.1939
##
##
## Site scores (weighted sums of species scores)
##
##             PC1        PC2       PC3       PC4
## 1295  -0.062345 -0.0585139 -0.020285 -0.205078
## 2102   0.318866 -0.0079075 -0.224086  0.248779
## 3102  -0.293864  0.1227631  0.130031  0.132033
## 4102   0.005370 -0.1115340 -0.064250 -0.303676
## 5102   0.401867  0.0292056 -0.265193  0.423015
## 6102  -0.025079 -0.0876930 -0.044481 -0.259341
## 7102   0.061582  0.0189972 -0.078894  0.118939
## 8102   0.031134  0.0428383 -0.059125  0.163275
## 9102  -0.025079 -0.0876930 -0.044481 -0.259341
## 10102  0.005370 -0.1115340 -0.064250 -0.303676
## 11102 -0.293864  0.1227631  0.130031  0.132033
## 1296  -0.293864  0.1227631  0.130031  0.132033
## 1313  -0.293864  0.1227631  0.130031  0.132033
## 1413   0.129298 -0.0340229 -0.122859  0.020340
## 1513   0.061582  0.0189972 -0.078894  0.118939
## 1613   1.182023  2.4114256  1.027155 -1.022407
## 1713  -0.110390 -0.0208955  0.010908 -0.135121
```

```
## 1813   0.235968 -0.0154427 -0.179334  0.160112
## 1912   0.162811 -0.0602634 -0.144618 -0.028458
## 2012   0.258269 -0.0329038 -0.193813  0.127641
## 2112   0.091410 -0.6071076  1.394358  0.412161
## 2212  -0.062345 -0.0585139 -0.020285 -0.205078
## 2312   0.162811 -0.0602634 -0.144618 -0.028458
## 2412   0.210224  0.0047146 -0.162619  0.197597
## 2512   0.210224  0.0047146 -0.162619  0.197597
## 2612  -0.293864  0.1227631  0.130031  0.132033
## 2712  -0.293864  0.1227631  0.130031  0.132033
## 2812  -0.025079 -0.0876930 -0.044481 -0.259341
## 2912  -0.025079 -0.0876930 -0.044481 -0.259341
## 3012  -0.025079 -0.0876930 -0.044481 -0.259341
## 3112   0.005370 -0.1115340 -0.064250 -0.303676
## 3212   0.146893 -0.0478003 -0.134283 -0.005281
## 3312  -0.025079 -0.0876930 -0.044481 -0.259341
## 3412   0.291724  0.0133441 -0.206464  0.288299
## 3512  -0.062345 -0.0585139 -0.020285 -0.205078
## 3612  -0.293864  0.1227631  0.130031  0.132033
## 3712   0.327014 -0.0142875 -0.229376  0.236914
## 3812  -0.293864  0.1227631  0.130031  0.132033
## 3912  -0.062345 -0.0585139 -0.020285 -0.205078
## 4012   0.146893 -0.0478003 -0.134283 -0.005281
## 4112   0.342207 -0.0261833 -0.239241  0.214792
## 4212   0.177342 -0.0716413 -0.154053 -0.049617
## 4312   0.005370 -0.1115340 -0.064250 -0.303676
## 4412   0.005370 -0.1115340 -0.064250 -0.303676
## 4512   0.430241  0.0069890 -0.283615  0.381700
## 4612  -0.062345 -0.0585139 -0.020285 -0.205078
## 4712   0.177342 -0.0716413 -0.154053 -0.049617
## 4812   0.414369  0.0582347 -0.268450  0.517002
## 4912   0.129298 -0.0340229 -0.122859  0.020340
## 5012   0.162811 -0.0602634 -0.144618 -0.028458
## 5112   0.005370 -0.1115340 -0.064250 -0.303676
## 5212   0.246922  0.0484233 -0.177376  0.353534
## 5312   0.162811 -0.0602634 -0.144618 -0.028458
## 5412  -0.293864  0.1227631  0.130031  0.132033
## 5512   0.413801  0.0198613 -0.272941  0.405638
## 5612   0.235968 -0.0154427 -0.179334  0.160112
## 5712   0.162811 -0.0602634 -0.144618 -0.028458
## 5812   0.129298 -0.0340229 -0.122859  0.020340
## 5912   0.087327 -0.0011601 -0.095609  0.081453
## 6012   0.387081 -0.0051286 -0.261341  0.311853
## 6112  -0.293864  0.1227631  0.130031  0.132033
## 6212  -0.062345 -0.0585139 -0.020285 -0.205078
## 6312  -0.293864  0.1227631  0.130031  0.132033
## 6412  -0.293864  0.1227631  0.130031  0.132033
## 6511   0.263408 -0.0369276 -0.197149  0.120158
## 6611   0.532168 -0.7776709  1.130043  0.274847
## 6711  -0.025079 -0.0876930 -0.044481 -0.259341
## 6811   0.031114 -0.1316914 -0.080965 -0.341162
## 6911  -0.121892  0.1626558  0.040229  0.386093
```

```
## 7011   0.562617 -0.8015120  1.110274  0.230511
## 7111   0.416388 -0.8615620  1.183362 -0.061035
## 7211  -0.025079 -0.0876930 -0.044481 -0.259341
## 7311   0.291724  0.0133441 -0.206464  0.288299
## 7411   0.005370 -0.1115340 -0.064250 -0.303676
## 7511   0.418045 -0.0293726 -0.281444  0.266768
## 7611   1.629873  1.6325586  2.250853 -0.833395
## 7711   0.258269 -0.0329038 -0.193813  0.127641
## 7811   0.195693  0.0160925 -0.153184  0.218756
## 7911   0.210224  0.0047146 -0.162619  0.197597
## 8011   0.334783 -0.0203706 -0.234421  0.225602
## 8111   0.342207 -0.0261833 -0.239241  0.214792
## 8211  -0.293864  0.1227631  0.130031  0.132033
## 8311   0.339352 -0.0963906 -0.246456  0.009577
## 8411   0.005370 -0.1115340 -0.064250 -0.303676
## 8511  -0.025079 -0.0876930 -0.044481 -0.259341
## 8611   0.258269 -0.0329038 -0.193813  0.127641
## 8710   0.268394 -0.0408313 -0.200386  0.112898
## 8811   0.319366  0.0478915 -0.217376  0.410452
## 8911  -0.110390 -0.0208955  0.010908 -0.135121
## 9011   0.005370 -0.1115340 -0.064250 -0.303676
## 9111   0.548085 -0.7901340  1.119708  0.251670
## 9210   0.399015 -0.0144729 -0.269089  0.294476
## 9310   0.031114 -0.1316914 -0.080965 -0.341162
## 9410  -0.025079 -0.0876930 -0.044481 -0.259341
## 9510   0.223592 -0.0057521 -0.171298  0.178133
## 9610  -0.110390 -0.0208955  0.010908 -0.135121
## 9711  -0.293864  0.1227631  0.130031  0.132033
## 9811  -0.293864  0.1227631  0.130031  0.132033
## 9911  -0.062345 -0.0585139 -0.020285 -0.205078
## 10011 -0.293864  0.1227631  0.130031  0.132033
## 10111 -0.110390 -0.0208955  0.010908 -0.135121
## 10211  0.430241  0.0069890 -0.283615  0.381700
## 10311  0.327014 -0.0142875 -0.229376  0.236914
## 10411 -0.293864  0.1227631  0.130031  0.132033
## 10511  0.162811 -0.0602634 -0.144618 -0.028458
## 10611  0.203086 -0.0917986 -0.170767 -0.087102
## 10711  0.087327 -0.0011601 -0.095609  0.081453
## 10811  0.146893 -0.0478003 -0.134283 -0.005281
## 10911 -0.110390 -0.0208955  0.010908 -0.135121
## 11011  0.146893 -0.0478003 -0.134283 -0.005281
## 11111 -0.293864  0.1227631  0.130031  0.132033
## 11211 -0.121892  0.1626558  0.040229  0.386093
## 11310 -0.121892  0.1626558  0.040229  0.386093
## 11411  0.061582  0.0189972 -0.078894  0.118939
## 11511  0.005370 -0.1115340 -0.064250 -0.303676
## 11611 -0.293864  0.1227631  0.130031  0.132033
## 11711 -0.293864  0.1227631  0.130031  0.132033
## 11811 -0.293864  0.1227631  0.130031  0.132033
## 11911 -0.293864  0.1227631  0.130031  0.132033
## 12011  0.146893 -0.0478003 -0.134283 -0.005281
## 12111  0.380778 -0.0001936 -0.257249  0.321030
```

```
## 12211  0.223592 -0.0057521 -0.171298  0.178133
## 12311  0.109627 -0.0186212 -0.110088  0.048982
## 12410  0.442743  0.0360181 -0.286872  0.475687
## 12511  0.005370 -0.1115340 -0.064250 -0.303676
## 12611  0.005370 -0.1115340 -0.064250 -0.303676
## 12711  0.177342 -0.0716413 -0.154053 -0.049617
## 12811  0.162811 -0.0602634 -0.144618 -0.028458
## 1297   0.374228  0.0049351 -0.252996  0.330568
## 1302  -0.293864  0.1227631  0.130031  0.132033
## 1314  -0.062345 -0.0585139 -0.020285 -0.205078
## 1322  -0.062345 -0.0585139 -0.020285 -0.205078
## 1332   0.177342 -0.0716413 -0.154053 -0.049617
## 1342   0.087327 -0.0011601 -0.095609  0.081453
## 1352   0.360195 -0.8175637  1.219846  0.020787
## 1362   0.647927 -0.8683094  1.054885  0.106291
## 1372   0.005370 -0.1115340 -0.064250 -0.303676
## 1382   0.258269 -0.0329038 -0.193813  0.127641
## 1392  -0.293864  0.1227631  0.130031  0.132033
## 1402   0.005370 -0.1115340 -0.064250 -0.303676
## 1414   0.162180  0.0423330 -0.131426  0.267554
## 1422   0.162811 -0.0602634 -0.144618 -0.028458
## 1432   0.784290 -0.7443435  0.995237  0.574603
## 1442   0.595499 -0.7251561  1.101707  0.477725
## 1452   0.061582  0.0189972 -0.078894  0.118939
## 1462   0.005370 -0.1115340 -0.064250 -0.303676
## 1472   0.195693  0.0160925 -0.153184  0.218756
## 1482   0.005370 -0.1115340 -0.064250 -0.303676
## 1492  -0.006133  0.0720173 -0.034930  0.217538
## 1502  -0.025079 -0.0876930 -0.044481 -0.259341
## 1514   0.185510  0.0965083 -0.137503  0.442956
## 1522   0.195693  0.0160925 -0.153184  0.218756
## 1532  -0.293864  0.1227631  0.130031  0.132033
## 1542   0.291724  0.0133441 -0.206464  0.288299
## 1552  -0.293864  0.1227631  0.130031  0.132033
## 1562  -0.110390 -0.0208955  0.010908 -0.135121
## 1572  -0.293864  0.1227631  0.130031  0.132033
## 1582   0.258269 -0.0329038 -0.193813  0.127641
## 1591  -0.025079 -0.0876930 -0.044481 -0.259341
## 1602   0.129298 -0.0340229 -0.122859  0.020340
## 1614   0.087327 -0.0011601 -0.095609  0.081453
## 1622   0.310299 -0.0012002 -0.218524  0.261252
## 1631   0.005370 -0.1115340 -0.064250 -0.303676
## 1642  -0.293864  0.1227631  0.130031  0.132033
## 1652  -0.293864  0.1227631  0.130031  0.132033
## 1662  -0.025079 -0.0876930 -0.044481 -0.259341
## 1672  -0.293864  0.1227631  0.130031  0.132033
## 1682   0.851454  1.1015362  0.261615 -0.143930
## 1692  -0.178105  0.0321246  0.054873 -0.036522
## 1702   0.190710 -0.0821080 -0.162732 -0.069081
## 1714   0.087327 -0.0011601 -0.095609  0.081453
## 1722   0.390644 -0.8414047  1.200076 -0.023549
## 1731   0.005370 -0.1115340 -0.064250 -0.303676
```

```
## 1742  -0.293864  0.1227631  0.130031  0.132033
## 1752   0.005370 -0.1115340 -0.064250 -0.303676
## 1762  -0.178105  0.0321246  0.054873 -0.036522
## 1772  -0.062345 -0.0585139 -0.020285 -0.205078
## 1782   0.233555  0.0588900 -0.168697  0.372999
## 1792  -0.293864  0.1227631  0.130031  0.132033
## 1801   0.129298 -0.0340229 -0.122859  0.020340
## 1814   0.363980 -0.5438791  1.252024  0.814836
## 1822  -0.293864  0.1227631  0.130031  0.132033
## 1832   0.258269 -0.0329038 -0.193813  0.127641
## 1842  -0.293864  0.1227631  0.130031  0.132033
## 1852  -0.293864  0.1227631  0.130031  0.132033
## 1862  -0.110390 -0.0208955  0.010908 -0.135121
## 1872  -0.293864  0.1227631  0.130031  0.132033
## 1881   0.223592 -0.0057521 -0.171298  0.178133
## 1891   0.005370 -0.1115340 -0.064250 -0.303676
## 1901  -0.293864  0.1227631  0.130031  0.132033
## 1913   0.162811 -0.0602634 -0.144618 -0.028458
## 1921   0.005370 -0.1115340 -0.064250 -0.303676
## 1931  -0.178105  0.0321246  0.054873 -0.036522
## 1941  -0.293864  0.1227631  0.130031  0.132033
## 1951  -0.293864  0.1227631  0.130031  0.132033
## 1961  -0.025079 -0.0876930 -0.044481 -0.259341
## 1971  -0.293864  0.1227631  0.130031  0.132033
## 1981   0.005370 -0.1115340 -0.064250 -0.303676
## 1991   0.177342 -0.0716413 -0.154053 -0.049617
## 2001  -0.054177  0.1096357 -0.003736  0.287495
## 2013  -0.293864  0.1227631  0.130031  0.132033
## 2021  -0.025079 -0.0876930 -0.044481 -0.259341
## 2031   1.209922  2.3895810  1.009041 -1.063030
## 2041   0.223592 -0.0057521 -0.171298  0.178133
## 2051   1.182023  2.4114256  1.027155 -1.022407
## 2061   0.146893 -0.0478003 -0.134283 -0.005281
## 2071   0.109627 -0.0186212 -0.110088  0.048982
## 2081  -0.293864  0.1227631  0.130031  0.132033
## 2091  -0.110390 -0.0208955  0.010908 -0.135121
## 2103   0.031134  0.0428383 -0.059125  0.163275
## 2113   0.031114 -0.1316914 -0.080965 -0.341162
## 2121  -0.293864  0.1227631  0.130031  0.132033
## 2131  -0.025079 -0.0876930 -0.044481 -0.259341
## 2141  -0.062345 -0.0585139 -0.020285 -0.205078
## 2151   0.281599  0.0212716 -0.199890  0.303042
## 2161  -0.110390 -0.0208955  0.010908 -0.135121
## 2171  -0.293864  0.1227631  0.130031  0.132033
## 2181  -0.121892  0.1626558  0.040229  0.386093
## 2191   0.888585 -1.2051232  1.797326  0.542990
## 2201   0.005370 -0.1115340 -0.064250 -0.303676
## 2213  -0.293864  0.1227631  0.130031  0.132033
## 2221   0.314482  0.0976275 -0.208457  0.550256
## 2231  -0.293864  0.1227631  0.130031  0.132033
## 2241  -0.293864  0.1227631  0.130031  0.132033
## 2251  -0.054177  0.1096357 -0.003736  0.287495
```

```
## 2261   0.195693  0.0160925 -0.153184  0.218756
## 2271  -0.293864  0.1227631  0.130031  0.132033
## 2281   0.247491 -0.0244645 -0.186815  0.143335
## 2291  -0.293864  0.1227631  0.130031  0.132033
## 2301   0.087327 -0.0011601 -0.095609  0.081453
## 2313   0.005370 -0.1115340 -0.064250 -0.303676
## 2321   0.382197  0.0446073 -0.252422  0.451657
## 2331   0.247491 -0.0244645 -0.186815  0.143335
## 2341   0.005370 -0.1115340 -0.064250 -0.303676
## 2351  -0.293864  0.1227631  0.130031  0.132033
## 2361   0.342207 -0.0261833 -0.239241  0.214792
## 2371  -0.110390 -0.0208955  0.010908 -0.135121
## 2381   0.031114 -0.1316914 -0.080965 -0.341162
## 2391  -0.293864  0.1227631  0.130031  0.132033
## 2401  -0.293864  0.1227631  0.130031  0.132033
## 2413  -0.025079 -0.0876930 -0.044481 -0.259341
## 2421  -0.062345 -0.0585139 -0.020285 -0.205078
## 2431   0.162811 -0.0602634 -0.144618 -0.028458
## 2441   0.195693  0.0160925 -0.153184  0.218756
## 2451  -0.110390 -0.0208955  0.010908 -0.135121
## 2461  -0.110390 -0.0208955  0.010908 -0.135121
## 2471   0.031134  0.0428383 -0.059125  0.163275
## 2481   0.162180  0.0423330 -0.131426  0.267554
## 2491   0.005370 -0.1115340 -0.064250 -0.303676
## 2501  -0.293864  0.1227631  0.130031  0.132033
## 2513  -0.293864  0.1227631  0.130031  0.132033
## 2521   0.146893 -0.0478003 -0.134283 -0.005281
## 253    0.375058 -0.0519059 -0.260570  0.166958
## 254   -0.006133  0.0720173 -0.034930  0.217538
## 255   -0.062345 -0.0585139 -0.020285 -0.205078
## 256    0.342207 -0.0261833 -0.239241  0.214792
## 257   -0.025079 -0.0876930 -0.044481 -0.259341
## 258    0.061582  0.0189972 -0.078894  0.118939
## 259    0.087327 -0.0011601 -0.095609  0.081453
## 260    0.109627 -0.0186212 -0.110088  0.048982
## 261    0.031114 -0.1316914 -0.080965 -0.341162
## 262    0.342207 -0.0261833 -0.239241  0.214792
## 263    0.005370 -0.1115340 -0.064250 -0.303676
## 264    0.005370 -0.1115340 -0.064250 -0.303676
## 265   -0.025079 -0.0876930 -0.044481 -0.259341
## 266    0.309821  0.0553658 -0.211178  0.424351
## 267    0.061582  0.0189972 -0.078894  0.118939
## 268    0.005370 -0.1115340 -0.064250 -0.303676
## 269    0.268394 -0.0408313 -0.200386  0.112898
## 270    0.190710 -0.0821080 -0.162732 -0.069081
## 271    0.295535 -0.0620829 -0.218008  0.073378
## 272   -0.062345 -0.0585139 -0.020285 -0.205078
## 273   -0.293864  0.1227631  0.130031  0.132033
## 274    0.382197  0.0446073 -0.252422  0.451657
## 275    0.349314 -0.0317486 -0.243855  0.204443
## 276   -0.062345 -0.0585139 -0.020285 -0.205078
## 277   -0.293864  0.1227631  0.130031  0.132033
```

```
## 278    0.527784 -0.6721360  1.145672  0.576324
## 279    0.087327 -0.0011601 -0.095609  0.081453
## 280   -0.025079 -0.0876930 -0.044481 -0.259341
## 281   -0.293864  0.1227631  0.130031  0.132033
## 282    0.223592 -0.0057521 -0.171298  0.178133
## 283    0.177342 -0.0716413 -0.154053 -0.049617
## 284    0.177342 -0.0716413 -0.154053 -0.049617
## 285    0.005370 -0.1115340 -0.064250 -0.303676
## 286    0.005370 -0.1115340 -0.064250 -0.303676
## 287   -0.062345 -0.0585139 -0.020285 -0.205078
## 288   -0.062345 -0.0585139 -0.020285 -0.205078
## 289   -0.110390 -0.0208955  0.010908 -0.135121
## 290    0.061582  0.0189972 -0.078894  0.118939
## 291    0.031134  0.0428383 -0.059125  0.163275
## 292    0.005370 -0.1115340 -0.064250 -0.303676
## 293    0.005370 -0.1115340 -0.064250 -0.303676
## 294   -0.025079 -0.0876930 -0.044481 -0.259341
## 295    0.301270  0.0058698 -0.212662  0.274400
## 296   -0.293864  0.1227631  0.130031  0.132033
## 297   -0.025079 -0.0876930 -0.044481 -0.259341
## 298   -0.025079 -0.0876930 -0.044481 -0.259341
## 299    0.213884  0.0742917 -0.155926  0.401640
## 300    0.146893 -0.0478003 -0.134283 -0.005281
## 301   -0.110390 -0.0208955  0.010908 -0.135121
## 302    0.162811 -0.0602634 -0.144618 -0.028458
## 303   -0.293864  0.1227631  0.130031  0.132033
## 304    0.061582  0.0189972 -0.078894  0.118939
## 305   -0.293864  0.1227631  0.130031  0.132033
## 306   -0.062345 -0.0585139 -0.020285 -0.205078
## 307    0.146893 -0.0478003 -0.134283 -0.005281
## 308   -0.178105  0.0321246  0.054873 -0.036522
## 309    0.005370 -0.1115340 -0.064250 -0.303676
## 310    0.031134  0.0428383 -0.059125  0.163275
## 311    0.268394 -0.0408313 -0.200386  0.112898
## 312   -0.025079 -0.0876930 -0.044481 -0.259341
## 313   -0.025079 -0.0876930 -0.044481 -0.259341
## 314   -0.293864  0.1227631  0.130031  0.132033
## 315    0.235968 -0.0154427 -0.179334  0.160112
## 316   -0.025079 -0.0876930 -0.044481 -0.259341
## 317   -0.293864  0.1227631  0.130031  0.132033
## 318   -0.293864  0.1227631  0.130031  0.132033
## 319    0.061582  0.0189972 -0.078894  0.118939
## 320   -0.293864  0.1227631  0.130031  0.132033
## 321    0.005370 -0.1115340 -0.064250 -0.303676
## 322   -0.110390 -0.0208955  0.010908 -0.135121
## 323    0.177342 -0.0716413 -0.154053 -0.049617
## 324   -0.062345 -0.0585139 -0.020285 -0.205078
## 325   -0.178105  0.0321246  0.054873 -0.036522
## 326    0.109627 -0.0186212 -0.110088  0.048982
## 327   -0.062345 -0.0585139 -0.020285 -0.205078
## 328    0.005370 -0.1115340 -0.064250 -0.303676
## 329   -0.025079 -0.0876930 -0.044481 -0.259341
```

```
## 330   -0.293864  0.1227631  0.130031  0.132033
## 331   -0.025079 -0.0876930 -0.044481 -0.259341
## 332   -0.110390 -0.0208955  0.010908 -0.135121
## 333    0.031114 -0.1316914 -0.080965 -0.341162
## 334    0.031114 -0.1316914 -0.080965 -0.341162
## 335    0.475955 -0.9082022  1.144687 -0.147769
## 336   -0.293864  0.1227631  0.130031  0.132033
## 337    0.005370 -0.1115340 -0.064250 -0.303676
## 338    0.268394 -0.0408313 -0.200386  0.112898
## 339   -0.293864  0.1227631  0.130031  0.132033
## 340   -0.293864  0.1227631  0.130031  0.132033
## 341    0.395564  0.0341407 -0.261101  0.432193
## 342    0.005370 -0.1115340 -0.064250 -0.303676
## 343    0.005370 -0.1115340 -0.064250 -0.303676
## 344   -0.293864  0.1227631  0.130031  0.132033
## 345   -0.025079 -0.0876930 -0.044481 -0.259341
## 346   -0.025079 -0.0876930 -0.044481 -0.259341
## 347    0.203086 -0.0917986 -0.170767 -0.087102
## 348    0.295535 -0.0620829 -0.218008  0.073378
## 349    0.061582  0.0189972 -0.078894  0.118939
## 350    0.005370 -0.1115340 -0.064250 -0.303676
## 351    0.466989  0.0170336 -0.302614  0.440382
## 352    0.245057 -0.1246614 -0.198018 -0.148215
## 353    0.146893 -0.0478003 -0.134283 -0.005281
## 354   -0.178105  0.0321246  0.054873 -0.036522
## 355    0.179776  0.0285556 -0.142850  0.241933
## 356    0.210224  0.0047146 -0.162619  0.197597
## 357    0.005370 -0.1115340 -0.064250 -0.303676
## 358   -0.025079 -0.0876930 -0.044481 -0.259341
## 359   -0.293864  0.1227631  0.130031  0.132033
## 360   -0.025079 -0.0876930 -0.044481 -0.259341
## 361   -0.121892  0.1626558  0.040229  0.386093
## 362   -0.293864  0.1227631  0.130031  0.132033
## 363    0.270821  0.0297109 -0.192893  0.318736
## 364   -0.062345 -0.0585139 -0.020285 -0.205078
## 365    0.005370 -0.1115340 -0.064250 -0.303676
## 366    0.005370 -0.1115340 -0.064250 -0.303676
## 367   -0.293864  0.1227631  0.130031  0.132033
## 368    0.005370 -0.1115340 -0.064250 -0.303676
## 369    0.005370 -0.1115340 -0.064250 -0.303676
## 370   -0.110390 -0.0208955  0.010908 -0.135121
## 371    0.087327 -0.0011601 -0.095609  0.081453
## 372   -0.025079 -0.0876930 -0.044481 -0.259341
## 373    0.005370 -0.1115340 -0.064250 -0.303676
## 374   -0.110390 -0.0208955  0.010908 -0.135121
## 375    0.342207 -0.0261833 -0.239241  0.214792
## 376    0.005370 -0.1115340 -0.064250 -0.303676
## 377   -0.121892  0.1626558  0.040229  0.386093
## 378   -0.062345 -0.0585139 -0.020285 -0.205078
## 379    0.005370 -0.1115340 -0.064250 -0.303676
## 380    0.005370 -0.1115340 -0.064250 -0.303676
## 381    0.005370 -0.1115340 -0.064250 -0.303676
```

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## 382    0.247491 -0.0244645 -0.186815  0.143335
## 383    0.005370 -0.1115340 -0.064250 -0.303676
## 384    0.268394 -0.0408313 -0.200386  0.112898
## 385   -0.293864  0.1227631  0.130031  0.132033
## 386    0.195693  0.0160925 -0.153184  0.218756
## 387   -0.293864  0.1227631  0.130031  0.132033
## 388    0.195693  0.0160925 -0.153184  0.218756
## 389    0.223592 -0.0057521 -0.171298  0.178133
## 390   -0.062345 -0.0585139 -0.020285 -0.205078
## 391   -0.025079 -0.0876930 -0.044481 -0.259341
## 392   -0.025079 -0.0876930 -0.044481 -0.259341
## 393    0.327014 -0.0142875 -0.229376  0.236914
## 394    0.268394 -0.0408313 -0.200386  0.112898
## 395    0.277939 -0.0483055 -0.206584  0.098999
## 396   -0.293864  0.1227631  0.130031  0.132033
## 397   -0.293864  0.1227631  0.130031  0.132033
## 398   -0.025079 -0.0876930 -0.044481 -0.259341
## 399   -0.025079 -0.0876930 -0.044481 -0.259341
## 400   -0.025079 -0.0876930 -0.044481 -0.259341
## 401    0.005370 -0.1115340 -0.064250 -0.303676
## 402    0.142509  0.0577347 -0.118654  0.296196
## 403   -0.293864  0.1227631  0.130031  0.132033
## 404   -0.025079 -0.0876930 -0.044481 -0.259341
## 405   -0.293864  0.1227631  0.130031  0.132033
## 406    0.177342 -0.0716413 -0.154053 -0.049617
## 407    0.146893 -0.0478003 -0.134283 -0.005281
## 408    0.268394 -0.0408313 -0.200386  0.112898
## 409   -0.293864  0.1227631  0.130031  0.132033
## 410   -0.062345 -0.0585139 -0.020285 -0.205078
## 411   -0.025079 -0.0876930 -0.044481 -0.259341
## 412    0.005370 -0.1115340 -0.064250 -0.303676
## 413    0.475955 -0.9082022  1.144687 -0.147769
## 414    0.177342 -0.0716413 -0.154053 -0.049617
## 415    0.005370 -0.1115340 -0.064250 -0.303676
## 416   -0.293864  0.1227631  0.130031  0.132033
## 417    0.162811 -0.0602634 -0.144618 -0.028458
## 418   -0.025079 -0.0876930 -0.044481 -0.259341
## 419    0.005370 -0.1115340 -0.064250 -0.303676
## 420    0.270821  0.0297109 -0.192893  0.318736
## 421   -0.293864  0.1227631  0.130031  0.132033
## 422   -0.293864  0.1227631  0.130031  0.132033
## 423    0.005370 -0.1115340 -0.064250 -0.303676
## 424   -0.025079 -0.0876930 -0.044481 -0.259341
## 425   -0.025079 -0.0876930 -0.044481 -0.259341
## 426    0.162811 -0.0602634 -0.144618 -0.028458
## 427   -0.110390 -0.0208955  0.010908 -0.135121
## 428    0.210224  0.0047146 -0.162619  0.197597
## 429    0.190710 -0.0821080 -0.162732 -0.069081
## 430    0.162811 -0.0602634 -0.144618 -0.028458
## 431    0.233555  0.0588900 -0.168697  0.372999
## 432    0.005370 -0.1115340 -0.064250 -0.303676
## 433   -0.062345 -0.0585139 -0.020285 -0.205078
```

```
## 434    0.177342 -0.0716413 -0.154053 -0.049617
## 435    0.177342 -0.0716413 -0.154053 -0.049617
## 436   -0.025079 -0.0876930 -0.044481 -0.259341
## 437   -0.025079 -0.0876930 -0.044481 -0.259341
## 438    0.393155 -0.0098842 -0.265284  0.303009
## 439    0.129298 -0.0340229 -0.122859  0.020340
## 440   -0.062345 -0.0585139 -0.020285 -0.205078
## 441   -0.293864  0.1227631  0.130031  0.132033
## 442    0.061582  0.0189972 -0.078894  0.118939
## 443    0.288918  0.0717325 -0.197607  0.454788
## 444    0.005370 -0.1115340 -0.064250 -0.303676
## 445   -0.110390 -0.0208955  0.010908 -0.135121
## 446   -0.062345 -0.0585139 -0.020285 -0.205078
## 447    0.177342 -0.0716413 -0.154053 -0.049617
## 448   -0.293864  0.1227631  0.130031  0.132033
## 449   -0.110390 -0.0208955  0.010908 -0.135121
## 450    0.247491 -0.0244645 -0.186815  0.143335
## 451   -0.062345 -0.0585139 -0.020285 -0.205078
## 452    0.129298 -0.0340229 -0.122859  0.020340
## 453    0.005370 -0.1115340 -0.064250 -0.303676
## 454    0.177342 -0.0716413 -0.154053 -0.049617
## 455   -0.110390 -0.0208955  0.010908 -0.135121
## 456    0.061582  0.0189972 -0.078894  0.118939
## 457   -0.293864  0.1227631  0.130031  0.132033
## 458   -0.293864  0.1227631  0.130031  0.132033
## 459    0.345110  0.0277342 -0.234091  0.372966
## 460    0.334152  0.0822257 -0.221228  0.521614
## 461    0.005370 -0.1115340 -0.064250 -0.303676
## 462    0.177342 -0.0716413 -0.154053 -0.049617
## 463   -0.110390 -0.0208955  0.010908 -0.135121
## 464   -0.025079 -0.0876930 -0.044481 -0.259341
## 465    0.005370 -0.1115340 -0.064250 -0.303676
## 466    0.393155 -0.0098842 -0.265284  0.303009
## 467   -0.062345 -0.0585139 -0.020285 -0.205078
## 468   -0.293864  0.1227631  0.130031  0.132033
## 469    0.005370 -0.1115340 -0.064250 -0.303676
## 470    0.223592 -0.0057521 -0.171298  0.178133
## 471    0.109627 -0.0186212 -0.110088  0.048982
## 472    0.061582  0.0189972 -0.078894  0.118939
## 473   -0.293864  0.1227631  0.130031  0.132033
## 474   -0.293864  0.1227631  0.130031  0.132033
## 475   -0.025079 -0.0876930 -0.044481 -0.259341
## 476   -0.178105  0.0321246  0.054873 -0.036522
## 477   -0.025079 -0.0876930 -0.044481 -0.259341
## 478    0.143539  0.1293711 -0.110253  0.504069
## 479    0.301270  0.0058698 -0.212662  0.274400
## 480   -0.293864  0.1227631  0.130031  0.132033
## 481   -0.178105  0.0321246  0.054873 -0.036522
## 482    0.087327 -0.0011601 -0.095609  0.081453
## 483   -0.293864  0.1227631  0.130031  0.132033
## 484   -0.293864  0.1227631  0.130031  0.132033
## 485    0.187924  0.0221757 -0.148140  0.230069
```

```
## 486   -0.293864  0.1227631  0.130031  0.132033
## 487    0.210224  0.0047146 -0.162619  0.197597
## 488   -0.062345 -0.0585139 -0.020285 -0.205078
## 489    0.005370 -0.1115340 -0.064250 -0.303676
## 490   -0.293864  0.1227631  0.130031  0.132033
## 491    0.839078  1.1112268  0.269651 -0.125909
## 492   -0.110390 -0.0208955  0.010908 -0.135121
## 493    0.129298 -0.0340229 -0.122859  0.020340
## 494   -0.293864  0.1227631  0.130031  0.132033
## 495   -0.025079 -0.0876930 -0.044481 -0.259341
## 496   -0.025079 -0.0876930 -0.044481 -0.259341
## 497    0.005370 -0.1115340 -0.064250 -0.303676
## 498    0.005370 -0.1115340 -0.064250 -0.303676
## 499    0.327014 -0.0142875 -0.229376  0.236914
## 500   -0.293864  0.1227631  0.130031  0.132033
## 501    0.195693  0.0160925 -0.153184  0.218756
## 502   -0.293864  0.1227631  0.130031  0.132033
## 503    0.223592 -0.0057521 -0.171298  0.178133
## 504   -0.062345 -0.0585139 -0.020285 -0.205078
## 505    0.005370 -0.1115340 -0.064250 -0.303676
## 506   -0.025079 -0.0876930 -0.044481 -0.259341
## 507    0.277939 -0.0483055 -0.206584  0.098999
## 508   -0.025079 -0.0876930 -0.044481 -0.259341
## 509    0.318866 -0.0079075 -0.224086  0.248779
## 510   -0.121892  0.1626558  0.040229  0.386093
## 511   -0.293864  0.1227631  0.130031  0.132033
## 512   -0.293864  0.1227631  0.130031  0.132033
## 513   -0.293864  0.1227631  0.130031  0.132033
## 514    0.120209  0.0751958 -0.104175  0.328668
## 515   -0.021295  0.1859916 -0.012302  0.534709
## 516    0.438689 -0.8790231  1.168883 -0.093506
## 517    0.416388 -0.8615620  1.183362 -0.061035
## 518    0.005370 -0.1115340 -0.064250 -0.303676
## 519    0.351748  0.0684484 -0.232652  0.495993
## 520    0.142509  0.0577347 -0.118654  0.296196
## 521   -0.293864  0.1227631  0.130031  0.132033
## 522    0.031114 -0.1316914 -0.080965 -0.341162
## 523    0.087327 -0.0011601 -0.095609  0.081453
## 524    0.005370 -0.1115340 -0.064250 -0.303676
## 525   -0.293864  0.1227631  0.130031  0.132033
## 526   -0.293864  0.1227631  0.130031  0.132033
## 527   -0.110390 -0.0208955  0.010908 -0.135121
## 528   -0.293864  0.1227631  0.130031  0.132033
## 529    0.061582  0.0189972 -0.078894  0.118939
## 530    0.005370 -0.1115340 -0.064250 -0.303676
## 531   -0.121892  0.1626558  0.040229  0.386093
## 532    0.318866 -0.0079075 -0.224086  0.248779
## 533   -0.293864  0.1227631  0.130031  0.132033
## 534    0.050080  0.2025486 -0.049574  0.640153
## 535    0.129298 -0.0340229 -0.122859  0.020340
## 536   -0.025079 -0.0876930 -0.044481 -0.259341
## 537    0.210224  0.0047146 -0.162619  0.197597
```

```
## 538   -0.293864  0.1227631  0.130031  0.132033
## 539    0.005370 -0.1115340 -0.064250 -0.303676
## 540   -0.006133  0.0720173 -0.034930  0.217538
## 541    0.309821  0.0553658 -0.211178  0.424351
## 542    0.005370 -0.1115340 -0.064250 -0.303676
## 543   -0.293864  0.1227631  0.130031  0.132033
## 544   -0.178105  0.0321246  0.054873 -0.036522
## 545   -0.293864  0.1227631  0.130031  0.132033
## 546   -0.025079 -0.0876930 -0.044481 -0.259341
## 547    0.031134  0.0428383 -0.059125  0.163275
## 548   -0.110390 -0.0208955  0.010908 -0.135121
## 549    0.162811 -0.0602634 -0.144618 -0.028458
## 550   -0.062345 -0.0585139 -0.020285 -0.205078
## 551   -0.025079 -0.0876930 -0.044481 -0.259341
## 552    0.247491 -0.0244645 -0.186815  0.143335
## 553    0.162180  0.0423330 -0.131426  0.267554
## 554    0.310299 -0.0012002 -0.218524  0.261252
## 555   -0.293864  0.1227631  0.130031  0.132033
## 556   -0.062345 -0.0585139 -0.020285 -0.205078
## 557   -0.025079 -0.0876930 -0.044481 -0.259341
## 558    0.246922  0.0484233 -0.177376  0.353534
## 559   -0.062345 -0.0585139 -0.020285 -0.205078
## 560   -0.025079 -0.0876930 -0.044481 -0.259341
## 561    0.334783 -0.0203706 -0.234421  0.225602
## 562    0.087327 -0.0011601 -0.095609  0.081453
## 563    0.005370 -0.1115340 -0.064250 -0.303676
## 564    0.177342 -0.0716413 -0.154053 -0.049617
## 565    0.162811 -0.0602634 -0.144618 -0.028458
## 566    0.910227  1.3285201  0.401018 -0.342567
## 567   -0.025079 -0.0876930 -0.044481 -0.259341
## 568    0.424939  0.0111405 -0.280173  0.389421
## 569    0.258269 -0.0329038 -0.193813  0.127641
## 570    0.005370 -0.1115340 -0.064250 -0.303676
## 571    0.177342 -0.0716413 -0.154053 -0.049617
## 572    0.258269 -0.0329038 -0.193813  0.127641
## 573    0.031114 -0.1316914 -0.080965 -0.341162
## 574    0.246922  0.0484233 -0.177376  0.353534
## 575    0.005370 -0.1115340 -0.064250 -0.303676
## 576    0.327014 -0.0142875 -0.229376  0.236914
## 577   -0.062345 -0.0585139 -0.020285 -0.205078
## 578   -0.006133  0.0720173 -0.034930  0.217538
## 579    0.005370 -0.1115340 -0.064250 -0.303676
## 580    0.005370 -0.1115340 -0.064250 -0.303676
## 581   -0.062345 -0.0585139 -0.020285 -0.205078
## 582    0.005370 -0.1115340 -0.064250 -0.303676
## 583    0.356132 -0.0370866 -0.248282  0.194516
## 584    0.301270  0.0058698 -0.212662  0.274400
## 585   -0.025079 -0.0876930 -0.044481 -0.259341
## 586   -0.054177  0.1096357 -0.003736  0.287495
## 587    0.258269 -0.0329038 -0.193813  0.127641
## 588    0.129298 -0.0340229 -0.122859  0.020340
## 589   -0.293864  0.1227631  0.130031  0.132033
```

```
## 590    0.475955 -0.9082022  1.144687 -0.147769
## 591    0.087327 -0.0011601 -0.095609  0.081453
## 592   -0.293864  0.1227631  0.130031  0.132033
## 593    0.005370 -0.1115340 -0.064250 -0.303676
## 594   -0.293864  0.1227631  0.130031  0.132033
## 595   -0.293864  0.1227631  0.130031  0.132033
## 596   -0.293864  0.1227631  0.130031  0.132033
## 597    0.179776  0.0285556 -0.142850  0.241933
## 598    0.087327 -0.0011601 -0.095609  0.081453
## 599    0.319366  0.0478915 -0.217376  0.410452
## 600    0.005370 -0.1115340 -0.064250 -0.303676
## 601   -0.293864  0.1227631  0.130031  0.132033
## 602   -0.293864  0.1227631  0.130031  0.132033
## 603    0.146893 -0.0478003 -0.134283 -0.005281
## 604    0.005370 -0.1115340 -0.064250 -0.303676
## 605   -0.293864  0.1227631  0.130031  0.132033
## 606    0.005370 -0.1115340 -0.064250 -0.303676
## 607   -0.293864  0.1227631  0.130031  0.132033
## 608    0.005370 -0.1115340 -0.064250 -0.303676
## 609    0.268394 -0.0408313 -0.200386  0.112898
## 610    0.258269 -0.0329038 -0.193813  0.127641
## 611   -0.293864  0.1227631  0.130031  0.132033
## 612    0.831734  1.3899795  0.451981 -0.228274
## 613    0.179776  0.0285556 -0.142850  0.241933
## 614    0.223592 -0.0057521 -0.171298  0.178133
## 615   -0.293864  0.1227631  0.130031  0.132033
## 616    0.005370 -0.1115340 -0.064250 -0.303676
## 617   -0.293864  0.1227631  0.130031  0.132033
## 618   -0.293864  0.1227631  0.130031  0.132033
## 619    0.031134  0.0428383 -0.059125  0.163275
## 620   -0.110390 -0.0208955  0.010908 -0.135121
## 621    0.162811 -0.0602634 -0.144618 -0.028458
## 622   -0.293864  0.1227631  0.130031  0.132033
## 623   -0.293864  0.1227631  0.130031  0.132033
## 624   -0.025079 -0.0876930 -0.044481 -0.259341
## 625   -0.025079 -0.0876930 -0.044481 -0.259341
## 626    0.532168 -0.7776709  1.130043  0.274847
## 627    0.177342 -0.0716413 -0.154053 -0.049617
## 628    0.190710 -0.0821080 -0.162732 -0.069081
## 629    0.281599  0.0212716 -0.199890  0.303042
## 630    0.258269 -0.0329038 -0.193813  0.127641
## 631    0.005370 -0.1115340 -0.064250 -0.303676
## 632    0.445207 -0.0047291 -0.293332  0.359909
## 633   -0.025079 -0.0876930 -0.044481 -0.259341
## 634    0.318866 -0.0079075 -0.224086  0.248779
## 635   -0.121892  0.1626558  0.040229  0.386093
## 636   -0.110390 -0.0208955  0.010908 -0.135121
## 637    0.318866 -0.0079075 -0.224086  0.248779
## 638    0.005370 -0.1115340 -0.064250 -0.303676
## 639    0.410153 -0.0231937 -0.276321  0.278258
## 640    0.031134  0.0428383 -0.059125  0.163275
## 641    0.318866 -0.0079075 -0.224086  0.248779
```

```
## 642    0.005370 -0.1115340 -0.064250 -0.303676
## 643    0.393155 -0.0098842 -0.265284  0.303009
## 644    0.435380  0.0029651 -0.286952  0.374217
## 645    0.087327 -0.0011601 -0.095609  0.081453
## 646    0.268394 -0.0408313 -0.200386  0.112898
## 647    0.031114 -0.1316914 -0.080965 -0.341162
## 648    0.031134  0.0428383 -0.059125  0.163275
## 649   -0.025079 -0.0876930 -0.044481 -0.259341
## 650    0.120209  0.0751958 -0.104175  0.328668
## 651    0.162811 -0.0602634 -0.144618 -0.028458
## 652    0.362682 -0.0422152 -0.252534  0.184979
## 653    0.005370 -0.1115340 -0.064250 -0.303676
## 654    0.094465  0.0953531 -0.087461  0.366153
## 655    0.109627 -0.0186212 -0.110088  0.048982
## 656   -0.293864  0.1227631  0.130031  0.132033
## 657    0.087327 -0.0011601 -0.095609  0.081453
## 658    0.031114 -0.1316914 -0.080965 -0.341162
## 659    0.223592 -0.0057521 -0.171298  0.178133
## 660   -0.121892  0.1626558  0.040229  0.386093
## 661   -0.025079 -0.0876930 -0.044481 -0.259341
## 662    0.247491 -0.0244645 -0.186815  0.143335
## 663    0.129298 -0.0340229 -0.122859  0.020340
## 664    0.177342 -0.0716413 -0.154053 -0.049617
## 665    0.223592 -0.0057521 -0.171298  0.178133
## 666    0.005370 -0.1115340 -0.064250 -0.303676
## 667   -0.025079 -0.0876930 -0.044481 -0.259341
## 668    0.087327 -0.0011601 -0.095609  0.081453
## 669    0.120209  0.0751958 -0.104175  0.328668
## 670   -0.025079 -0.0876930 -0.044481 -0.259341
## 671    0.310299 -0.0012002 -0.218524  0.261252
## 672    0.286969 -0.0553756 -0.212446  0.085851
## 673   -0.293864  0.1227631  0.130031  0.132033
## 674    0.466989  0.0170336 -0.302614  0.440382
## 675    0.005370 -0.1115340 -0.064250 -0.303676
## 676    0.179776  0.0285556 -0.142850  0.241933
## 677   -0.025079 -0.0876930 -0.044481 -0.259341
## 678   -0.025079 -0.0876930 -0.044481 -0.259341
## 679   -0.025079 -0.0876930 -0.044481 -0.259341
## 680    0.061582  0.0189972 -0.078894  0.118939
## 681   -0.110390 -0.0208955  0.010908 -0.135121
## 682    0.005370 -0.1115340 -0.064250 -0.303676
## 683    0.129298 -0.0340229 -0.122859  0.020340
## 684    0.778429 -0.7397549  0.999042  0.583137
## 685    0.380778 -0.0001936 -0.257249  0.321030
## 686    0.031114 -0.1316914 -0.080965 -0.341162
## 687    0.162811 -0.0602634 -0.144618 -0.028458
## 688    0.233555  0.0588900 -0.168697  0.372999
## 689    0.120209  0.0751958 -0.104175  0.328668
## 690    0.005370 -0.1115340 -0.064250 -0.303676
## 691    0.235968 -0.0154427 -0.179334  0.160112
## 692   -0.062345 -0.0585139 -0.020285 -0.205078
## 693    0.005370 -0.1115340 -0.064250 -0.303676
```

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## 694   -0.025079 -0.0876930 -0.044481 -0.259341
## 695    0.680810 -0.7919536  1.046318  0.353505
## 696   -0.025079 -0.0876930 -0.044481 -0.259341
## 697   -0.293864  0.1227631  0.130031  0.132033
## 698    0.031114 -0.1316914 -0.080965 -0.341162
## 699    0.165840  0.1119101 -0.124732  0.471597
## 700    0.431964  0.0444574 -0.279874  0.491381
## 701   -0.025079 -0.0876930 -0.044481 -0.259341
## 702    0.387081 -0.0051286 -0.261341  0.311853
## 703    0.270821  0.0297109 -0.192893  0.318736
## 704   -0.293864  0.1227631  0.130031  0.132033
## 705    0.031134  0.0428383 -0.059125  0.163275
## 706   -0.025079 -0.0876930 -0.044481 -0.259341
## 707   -0.293864  0.1227631  0.130031  0.132033
## 708    0.061582  0.0189972 -0.078894  0.118939
## 709   -0.293864  0.1227631  0.130031  0.132033
## 710   -0.121892  0.1626558  0.040229  0.386093
## 711    0.005370 -0.1115340 -0.064250 -0.303676
## 712    0.129298 -0.0340229 -0.122859  0.020340
## 713   -0.293864  0.1227631  0.130031  0.132033
## 714   -0.062345 -0.0585139 -0.020285 -0.205078
## 715   -0.025079 -0.0876930 -0.044481 -0.259341
## 716    0.179776  0.0285556 -0.142850  0.241933
## 717    0.064016  0.1191941 -0.067691  0.410489
## 718    0.005370 -0.1115340 -0.064250 -0.303676
## 719   -0.062345 -0.0585139 -0.020285 -0.205078
## 720    0.749892  1.9020645  0.787890 -0.240466
## 721    0.281599  0.0212716 -0.199890  0.303042
## 722    0.005370 -0.1115340 -0.064250 -0.303676
## 723   -0.110390 -0.0208955  0.010908 -0.135121
## 724    0.457708  0.0243001 -0.296589  0.453895
## 725   -0.110390 -0.0208955  0.010908 -0.135121
## 726   -0.025079 -0.0876930 -0.044481 -0.259341
## 727    0.005370 -0.1115340 -0.064250 -0.303676
## 728   -0.293864  0.1227631  0.130031  0.132033
## 729   -0.293864  0.1227631  0.130031  0.132033
## 730    0.263382 -0.5672148  1.304555  0.666221
## 731   -0.293864  0.1227631  0.130031  0.132033
## 732   -0.062345 -0.0585139 -0.020285 -0.205078
## 733    0.345110  0.0277342 -0.234091  0.372966
## 734    0.005370 -0.1115340 -0.064250 -0.303676
## 735   -0.121892  0.1626558  0.040229  0.386093
## 736   -0.293864  0.1227631  0.130031  0.132033
## 737   -0.293864  0.1227631  0.130031  0.132033
## 738   -0.006133  0.0720173 -0.034930  0.217538
## 739   -0.062345 -0.0585139 -0.020285 -0.205078
## 740   -0.293864  0.1227631  0.130031  0.132033
## 741   -0.062345 -0.0585139 -0.020285 -0.205078
## 742   -0.293864  0.1227631  0.130031  0.132033
## 743   -0.293864  0.1227631  0.130031  0.132033
## 744    0.235968 -0.0154427 -0.179334  0.160112
## 745   -0.293864  0.1227631  0.130031  0.132033
```

```
## 746    0.270821  0.0297109 -0.192893  0.318736
## 747   -0.062345 -0.0585139 -0.020285 -0.205078
## 748   -0.293864  0.1227631  0.130031  0.132033
## 749   -0.293864  0.1227631  0.130031  0.132033
## 750   -0.025079 -0.0876930 -0.044481 -0.259341
## 751    0.005370 -0.1115340 -0.064250 -0.303676
## 752   -0.293864  0.1227631  0.130031  0.132033
## 753   -0.025079 -0.0876930 -0.044481 -0.259341
## 754    0.005370 -0.1115340 -0.064250 -0.303676
## 755    0.387081 -0.0051286 -0.261341  0.311853
## 756    0.005370 -0.1115340 -0.064250 -0.303676
## 757    0.868452  1.0882267  0.250579 -0.168681
## 758   -0.293864  0.1227631  0.130031  0.132033
## 759   -0.293864  0.1227631  0.130031  0.132033
## 760   -0.025079 -0.0876930 -0.044481 -0.259341
## 761    0.223592 -0.0057521 -0.171298  0.178133
## 762    1.106539  2.4705289  1.076164 -0.912496
## 763    0.177342 -0.0716413 -0.154053 -0.049617
## 764    0.129298 -0.0340229 -0.122859  0.020340
## 765   -0.293864  0.1227631  0.130031  0.132033
## 766   -0.121892  0.1626558  0.040229  0.386093
## 767   -0.062345 -0.0585139 -0.020285 -0.205078
## 768   -0.025079 -0.0876930 -0.044481 -0.259341
## 769    0.005370 -0.1115340 -0.064250 -0.303676
## 770   -0.293864  0.1227631  0.130031  0.132033
## 771    0.177342 -0.0716413 -0.154053 -0.049617
## 772    0.005370 -0.1115340 -0.064250 -0.303676
## 773   -0.054177  0.1096357 -0.003736  0.287495
## 774    0.258269 -0.0329038 -0.193813  0.127641
## 775   -0.293864  0.1227631  0.130031  0.132033
## 776   -0.025079 -0.0876930 -0.044481 -0.259341
## 777   -0.062345 -0.0585139 -0.020285 -0.205078
## 778   -0.062345 -0.0585139 -0.020285 -0.205078
## 779   -0.062345 -0.0585139 -0.020285 -0.205078
## 780    0.087327 -0.0011601 -0.095609  0.081453
## 781    0.005370 -0.1115340 -0.064250 -0.303676
## 782    0.087327 -0.0011601 -0.095609  0.081453
## 783   -0.293864  0.1227631  0.130031  0.132033
## 784   -0.293864  0.1227631  0.130031  0.132033
## 785    0.246922  0.0484233 -0.177376  0.353534
## 786    0.005370 -0.1115340 -0.064250 -0.303676
## 787    0.177342 -0.0716413 -0.154053 -0.049617
## 788   -0.293864  0.1227631  0.130031  0.132033
## 789    0.195693  0.0160925 -0.153184  0.218756
## 790    0.005370 -0.1115340 -0.064250 -0.303676
## 791    0.005370 -0.1115340 -0.064250 -0.303676
## 792   -0.293864  0.1227631  0.130031  0.132033
## 793    0.259299  0.0387326 -0.185412  0.335513
## 794    0.005370 -0.1115340 -0.064250 -0.303676
## 795   -0.110390 -0.0208955  0.010908 -0.135121
## 796    0.399015 -0.0144729 -0.269089  0.294476
## 797   -0.293864  0.1227631  0.130031  0.132033
```

```
## 798   -0.293864  0.1227631  0.130031  0.132033
## 799   -0.062345 -0.0585139 -0.020285 -0.205078
## 800    0.005370 -0.1115340 -0.064250 -0.303676
## 801    0.268394 -0.0408313 -0.200386  0.112898
## 802    0.223592 -0.0057521 -0.171298  0.178133
## 803   -0.025079 -0.0876930 -0.044481 -0.259341
## 804   -0.025079 -0.0876930 -0.044481 -0.259341
## 805   -0.110390 -0.0208955  0.010908 -0.135121
## 806   -0.293864  0.1227631  0.130031  0.132033
## 807   -0.025079 -0.0876930 -0.044481 -0.259341
## 808    0.005370 -0.1115340 -0.064250 -0.303676
## 809   -0.110390 -0.0208955  0.010908 -0.135121
## 810   -0.110390 -0.0208955  0.010908 -0.135121
## 811    0.005370 -0.1115340 -0.064250 -0.303676
## 812    0.031114 -0.1316914 -0.080965 -0.341162
## 813    0.129298 -0.0340229 -0.122859  0.020340
## 814    0.146893 -0.0478003 -0.134283 -0.005281
## 815   -0.293864  0.1227631  0.130031  0.132033
## 816    0.233555  0.0588900 -0.168697  0.372999
## 817    0.223592 -0.0057521 -0.171298  0.178133
## 818   -0.293864  0.1227631  0.130031  0.132033
## 819    0.005370 -0.1115340 -0.064250 -0.303676
## 820    0.005370 -0.1115340 -0.064250 -0.303676
## 821   -0.293864  0.1227631  0.130031  0.132033
## 822   -0.025079 -0.0876930 -0.044481 -0.259341
## 823   -0.178105  0.0321246  0.054873 -0.036522
## 824   -0.293864  0.1227631  0.130031  0.132033
## 825   -0.062345 -0.0585139 -0.020285 -0.205078
## 826    0.005370 -0.1115340 -0.064250 -0.303676
## 827    0.146893 -0.0478003 -0.134283 -0.005281
## 828   -0.293864  0.1227631  0.130031  0.132033
## 829   -0.062345 -0.0585139 -0.020285 -0.205078
## 830   -0.025079 -0.0876930 -0.044481 -0.259341
## 831   -0.025079 -0.0876930 -0.044481 -0.259341
## 832   -0.121892  0.1626558  0.040229  0.386093
## 833   -0.293864  0.1227631  0.130031  0.132033
## 834   -0.121892  0.1626558  0.040229  0.386093
## 835   -0.178105  0.0321246  0.054873 -0.036522
## 836   -0.025079 -0.0876930 -0.044481 -0.259341
## 837   -0.025079 -0.0876930 -0.044481 -0.259341
## 838   -0.293864  0.1227631  0.130031  0.132033
## 839   -0.062345 -0.0585139 -0.020285 -0.205078
## 840   -0.293864  0.1227631  0.130031  0.132033
## 841    0.146893 -0.0478003 -0.134283 -0.005281
## 842   -0.121892  0.1626558  0.040229  0.386093
## 843    0.129298 -0.0340229 -0.122859  0.020340
## 844    0.005370 -0.1115340 -0.064250 -0.303676
## 845    0.322929 -0.7883846  1.244041  0.075050
## 846    0.491872 -0.9206653  1.134353 -0.170946
## 847   -0.006133  0.0720173 -0.034930  0.217538
## 848   -0.062345 -0.0585139 -0.020285 -0.205078
## 849   -0.025079 -0.0876930 -0.044481 -0.259341
```

```
## 850    0.005370 -0.1115340 -0.064250 -0.303676
## 851   -0.025079 -0.0876930 -0.044481 -0.259341
## 852    0.129298 -0.0340229 -0.122859  0.020340
## 853    0.374228  0.0049351 -0.252996  0.330568
## 854   -0.110390 -0.0208955  0.010908 -0.135121
## 855    0.005370 -0.1115340 -0.064250 -0.303676
## 856   -0.025079 -0.0876930 -0.044481 -0.259341
## 857   -0.121892  0.1626558  0.040229  0.386093
## 858   -0.025079 -0.0876930 -0.044481 -0.259341
## 859    0.233555  0.0588900 -0.168697  0.372999
## 860    0.109627 -0.0186212 -0.110088  0.048982
## 861    0.087327 -0.0011601 -0.095609  0.081453
## 862    0.087327 -0.0011601 -0.095609  0.081453
## 863   -0.293864  0.1227631  0.130031  0.132033
## 864    0.005370 -0.1115340 -0.064250 -0.303676
## 865   -0.293864  0.1227631  0.130031  0.132033
## 866   -0.293864  0.1227631  0.130031  0.132033
## 867   -0.293864  0.1227631  0.130031  0.132033
## 868   -0.025079 -0.0876930 -0.044481 -0.259341
## 869   -0.293864  0.1227631  0.130031  0.132033
## 870   -0.293864  0.1227631  0.130031  0.132033
## 871   -0.178105  0.0321246  0.054873 -0.036522
## 872    0.005370 -0.1115340 -0.064250 -0.303676
## 873   -0.062345 -0.0585139 -0.020285 -0.205078
## 874    0.129298 -0.0340229 -0.122859  0.020340
## 875    0.005370 -0.1115340 -0.064250 -0.303676
## 876   -0.293864  0.1227631  0.130031  0.132033
## 877   -0.178105  0.0321246  0.054873 -0.036522
## 878   -0.121892  0.1626558  0.040229  0.386093
## 879    0.195693  0.0160925 -0.153184  0.218756
## 880   -0.062345 -0.0585139 -0.020285 -0.205078
## 881   -0.293864  0.1227631  0.130031  0.132033
## 882    0.005370 -0.1115340 -0.064250 -0.303676
## 883    0.258269 -0.0329038 -0.193813  0.127641
## 884    0.005370 -0.1115340 -0.064250 -0.303676
## 885   -0.293864  0.1227631  0.130031  0.132033
## 886   -0.293864  0.1227631  0.130031  0.132033
## 887   -0.293864  0.1227631  0.130031  0.132033
## 888   -0.121892  0.1626558  0.040229  0.386093
## 889    0.342207 -0.0261833 -0.239241  0.214792
## 890    0.031134  0.0428383 -0.059125  0.163275
## 891   -0.293864  0.1227631  0.130031  0.132033
## 892    0.005370 -0.1115340 -0.064250 -0.303676
## 893   -0.178105  0.0321246  0.054873 -0.036522
## 894    0.005370 -0.1115340 -0.064250 -0.303676
## 895    0.087327 -0.0011601 -0.095609  0.081453
## 896    0.268394 -0.0408313 -0.200386  0.112898
## 897   -0.293864  0.1227631  0.130031  0.132033
## 898    0.087327 -0.0011601 -0.095609  0.081453
## 899   -0.025079 -0.0876930 -0.044481 -0.259341
## 900   -0.293864  0.1227631  0.130031  0.132033
## 901   -0.293864  0.1227631  0.130031  0.132033
```

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## 902    0.162811 -0.0602634 -0.144618 -0.028458
## 903    0.177342 -0.0716413 -0.154053 -0.049617
## 904   -0.293864  0.1227631  0.130031  0.132033
## 905    0.610661 -0.8391304  1.079080  0.160554
## 906    0.031114 -0.1316914 -0.080965 -0.341162
## 907    0.223592 -0.0057521 -0.171298  0.178133
## 908    0.087327 -0.0011601 -0.095609  0.081453
## 909    0.005370 -0.1115340 -0.064250 -0.303676
## 910    0.005370 -0.1115340 -0.064250 -0.303676
## 911   -0.121892  0.1626558  0.040229  0.386093
## 912   -0.006133  0.0720173 -0.034930  0.217538
## 913   -0.293864  0.1227631  0.130031  0.132033
## 914    0.026750  0.1483732 -0.043496  0.464752
## 915   -0.293864  0.1227631  0.130031  0.132033
## 916   -0.121892  0.1626558  0.040229  0.386093
## 917   -0.293864  0.1227631  0.130031  0.132033
## 918   -0.293864  0.1227631  0.130031  0.132033
## 919   -0.178105  0.0321246  0.054873 -0.036522
## 920    0.142509  0.0577347 -0.118654  0.296196
## 921    0.064016  0.1191941 -0.067691  0.410489
## 922    0.005370 -0.1115340 -0.064250 -0.303676
## 923   -0.025079 -0.0876930 -0.044481 -0.259341
## 924   -0.062345 -0.0585139 -0.020285 -0.205078
## 925   -0.293864  0.1227631  0.130031  0.132033
## 926    0.026750  0.1483732 -0.043496  0.464752
## 927   -0.293864  0.1227631  0.130031  0.132033
## 928    0.120209  0.0751958 -0.104175  0.328668
## 929    0.087327 -0.0011601 -0.095609  0.081453
## 930   -0.293864  0.1227631  0.130031  0.132033
## 931   -0.025079 -0.0876930 -0.044481 -0.259341
## 932   -0.293864  0.1227631  0.130031  0.132033
## 933    0.094465  0.0953531 -0.087461  0.366153
## 934   -0.293864  0.1227631  0.130031  0.132033
## 935    0.179776  0.0285556 -0.142850  0.241933
## 936   -0.178105  0.0321246  0.054873 -0.036522
## 937    0.005370 -0.1115340 -0.064250 -0.303676
## 938    0.129298 -0.0340229 -0.122859  0.020340
## 939   -0.121892  0.1626558  0.040229  0.386093
## 940    0.146893 -0.0478003 -0.134283 -0.005281
## 941   -0.121892  0.1626558  0.040229  0.386093
## 942    0.146893 -0.0478003 -0.134283 -0.005281
## 943   -0.293864  0.1227631  0.130031  0.132033
## 944    0.210224  0.0047146 -0.162619  0.197597
## 945    0.162180  0.0423330 -0.131426  0.267554
## 946   -0.293864  0.1227631  0.130031  0.132033
## 947   -0.293864  0.1227631  0.130031  0.132033
## 948   -0.293864  0.1227631  0.130031  0.132033
## 949   -0.293864  0.1227631  0.130031  0.132033
## 950   -0.025079 -0.0876930 -0.044481 -0.259341
## 951   -0.293864  0.1227631  0.130031  0.132033
## 952   -0.293864  0.1227631  0.130031  0.132033
## 953   -0.025079 -0.0876930 -0.044481 -0.259341
```

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## 954   -0.025079 -0.0876930 -0.044481 -0.259341
## 955   -0.062345 -0.0585139 -0.020285 -0.205078
## 956   -0.025079 -0.0876930 -0.044481 -0.259341
## 957   -0.062345 -0.0585139 -0.020285 -0.205078
## 958   -0.293864  0.1227631  0.130031  0.132033
## 959   -0.025079 -0.0876930 -0.044481 -0.259341
## 960   -0.110390 -0.0208955  0.010908 -0.135121
## 961    0.146893 -0.0478003 -0.134283 -0.005281
## 962   -0.025079 -0.0876930 -0.044481 -0.259341
## 963    0.031134  0.0428383 -0.059125  0.163275
## 964   -0.293864  0.1227631  0.130031  0.132033
## 965   -0.021295  0.1859916 -0.012302  0.534709
## 966   -0.121892  0.1626558  0.040229  0.386093
## 967   -0.062345 -0.0585139 -0.020285 -0.205078
## 968   -0.121892  0.1626558  0.040229  0.386093
## 969   -0.293864  0.1227631  0.130031  0.132033
## 970   -0.293864  0.1227631  0.130031  0.132033
## 971    0.177342 -0.0716413 -0.154053 -0.049617
## 972   -0.062345 -0.0585139 -0.020285 -0.205078
## 973   -0.110390 -0.0208955  0.010908 -0.135121
## 974   -0.293864  0.1227631  0.130031  0.132033
## 975   -0.110390 -0.0208955  0.010908 -0.135121
## 976    0.087327 -0.0011601 -0.095609  0.081453
## 977   -0.062345 -0.0585139 -0.020285 -0.205078
## 978    0.005370 -0.1115340 -0.064250 -0.303676
## 979    0.031134  0.0428383 -0.059125  0.163275
## 980   -0.293864  0.1227631  0.130031  0.132033
## 981    0.235968 -0.0154427 -0.179334  0.160112
## 982   -0.293864  0.1227631  0.130031  0.132033
## 983    0.005370 -0.1115340 -0.064250 -0.303676
## 984   -0.293864  0.1227631  0.130031  0.132033
## 985   -0.293864  0.1227631  0.130031  0.132033
## 986   -0.025079 -0.0876930 -0.044481 -0.259341
## 987   -0.293864  0.1227631  0.130031  0.132033
## 988   -0.293864  0.1227631  0.130031  0.132033
## 989   -0.293864  0.1227631  0.130031  0.132033
## 990   -0.293864  0.1227631  0.130031  0.132033
## 991    0.146893 -0.0478003 -0.134283 -0.005281
## 992   -0.025079 -0.0876930 -0.044481 -0.259341
## 993   -0.293864  0.1227631  0.130031  0.132033
## 994    0.005370 -0.1115340 -0.064250 -0.303676
## 995   -0.025079 -0.0876930 -0.044481 -0.259341
## 996   -0.110390 -0.0208955  0.010908 -0.135121
## 997   -0.025079 -0.0876930 -0.044481 -0.259341
## 998    0.005370 -0.1115340 -0.064250 -0.303676
## 999   -0.293864  0.1227631  0.130031  0.132033
## 1000  -0.054177  0.1096357 -0.003736  0.287495
## 1001   0.142509  0.0577347 -0.118654  0.296196
## 1002   0.223592 -0.0057521 -0.171298  0.178133
## 1003  -0.062345 -0.0585139 -0.020285 -0.205078
## 1004  -0.293864  0.1227631  0.130031  0.132033
## 1005   0.129298 -0.0340229 -0.122859  0.020340
```

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## 1006   0.109627 -0.0186212 -0.110088  0.048982
## 1007  -0.062345 -0.0585139 -0.020285 -0.205078
## 1008   0.419463  0.0154283 -0.276617  0.397394
## 1009  -0.293864  0.1227631  0.130031  0.132033
## 1010  -0.121892  0.1626558  0.040229  0.386093
## 1011  -0.293864  0.1227631  0.130031  0.132033
## 1012  -0.293864  0.1227631  0.130031  0.132033
## 1013   0.005370 -0.1115340 -0.064250 -0.303676
## 1014   0.162811 -0.0602634 -0.144618 -0.028458
## 1015   0.005370 -0.1115340 -0.064250 -0.303676
## 1016  -0.006133  0.0720173 -0.034930  0.217538
## 1017  -0.025079 -0.0876930 -0.044481 -0.259341
## 1018  -0.025079 -0.0876930 -0.044481 -0.259341
## 1019  -0.110390 -0.0208955  0.010908 -0.135121
## 1020  -0.025079 -0.0876930 -0.044481 -0.259341
## 1021  -0.062345 -0.0585139 -0.020285 -0.205078
## 1022  -0.025079 -0.0876930 -0.044481 -0.259341
## 1023  -0.293864  0.1227631  0.130031  0.132033
## 1024   1.222298  2.3798904  1.001006 -1.081051
## 1025   0.005370 -0.1115340 -0.064250 -0.303676
## 1026  -0.025079 -0.0876930 -0.044481 -0.259341
## 1027   0.292181  0.1150885 -0.193978  0.582727
## 1028   0.061582  0.0189972 -0.078894  0.118939
## 1029   0.162811 -0.0602634 -0.144618 -0.028458
## 1030  -0.062345 -0.0585139 -0.020285 -0.205078
## 1031   0.268394 -0.0408313 -0.200386  0.112898
## 1032   0.251151  0.0451126 -0.180121  0.347378
## 1033  -0.025079 -0.0876930 -0.044481 -0.259341
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## 1035  -0.025079 -0.0876930 -0.044481 -0.259341
## 1036   0.005370 -0.1115340 -0.064250 -0.303676
## 1037   0.310299 -0.0012002 -0.218524  0.261252
## 1038   0.162180  0.0423330 -0.131426  0.267554
## 1039  -0.293864  0.1227631  0.130031  0.132033
## 1040  -0.293864  0.1227631  0.130031  0.132033
## 1041  -0.110390 -0.0208955  0.010908 -0.135121
## 1042   0.129298 -0.0340229 -0.122859  0.020340
## 1043   0.268394 -0.0408313 -0.200386  0.112898
## 1044  -0.110390 -0.0208955  0.010908 -0.135121
## 1045   0.286969 -0.0553756 -0.212446  0.085851
## 1046   0.109627 -0.0186212 -0.110088  0.048982
## 1047   0.195693  0.0160925 -0.153184  0.218756
## 1048   0.309821  0.0553658 -0.211178  0.424351
## 1049   0.031114 -0.1316914 -0.080965 -0.341162
## 1050   0.005370 -0.1115340 -0.064250 -0.303676
## 1051   0.277939 -0.0483055 -0.206584  0.098999
## 1052   0.548085 -0.7901340  1.119708  0.251670
## 1053   0.005370 -0.1115340 -0.064250 -0.303676
## 1054   0.005370 -0.1115340 -0.064250 -0.303676
## 1055  -0.025079 -0.0876930 -0.044481 -0.259341
## 1056  -0.025079 -0.0876930 -0.044481 -0.259341
## 1057   0.061582  0.0189972 -0.078894  0.118939
```

```
## 1058  -0.293864  0.1227631  0.130031  0.132033
## 1059  -0.293864  0.1227631  0.130031  0.132033
## 1060  -0.293864  0.1227631  0.130031  0.132033
## 1061   0.005370 -0.1115340 -0.064250 -0.303676
## 1062   0.061582  0.0189972 -0.078894  0.118939
## 1063   0.210224  0.0047146 -0.162619  0.197597
## 1064  -0.293864  0.1227631  0.130031  0.132033
## 1065  -0.062345 -0.0585139 -0.020285 -0.205078
## 1066  -0.025079 -0.0876930 -0.044481 -0.259341
## 1067   0.005370 -0.1115340 -0.064250 -0.303676
## 1068   0.162811 -0.0602634 -0.144618 -0.028458
## 1069   0.005370 -0.1115340 -0.064250 -0.303676
## 1070   0.087327 -0.0011601 -0.095609  0.081453
## 1071  -0.293864  0.1227631  0.130031  0.132033
## 1072  -0.293864  0.1227631  0.130031  0.132033
## 1073  -0.293864  0.1227631  0.130031  0.132033
## 1074   0.091410 -0.6071076  1.394358  0.412161
## 1075  -0.293864  0.1227631  0.130031  0.132033
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## 1077   0.087327 -0.0011601 -0.095609  0.081453
## 1078  -0.293864  0.1227631  0.130031  0.132033
## 1079  -0.025079 -0.0876930 -0.044481 -0.259341
## 1080  -0.006133  0.0720173 -0.034930  0.217538
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## 1082   0.438689 -0.8790231  1.168883 -0.093506
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## 1084   0.162811 -0.0602634 -0.144618 -0.028458
## 1085  -0.293864  0.1227631  0.130031  0.132033
## 1086  -0.293864  0.1227631  0.130031  0.132033
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## 1088   0.005370 -0.1115340 -0.064250 -0.303676
## 1089  -0.062345 -0.0585139 -0.020285 -0.205078
## 1090   0.005370 -0.1115340 -0.064250 -0.303676
## 1091   0.005370 -0.1115340 -0.064250 -0.303676
## 1092  -0.293864  0.1227631  0.130031  0.132033
## 1093  -0.025079 -0.0876930 -0.044481 -0.259341
## 1094   0.362682 -0.0422152 -0.252534  0.184979
## 1095   0.162811 -0.0602634 -0.144618 -0.028458
## 1096  -0.293864  0.1227631  0.130031  0.132033
## 1097   0.162811 -0.0602634 -0.144618 -0.028458
## 1098   0.177342 -0.0716413 -0.154053 -0.049617
## 1099   0.005370 -0.1115340 -0.064250 -0.303676
## 1100  -0.293864  0.1227631  0.130031  0.132033
## 1101   0.031114 -0.1316914 -0.080965 -0.341162
## 1102   0.129298 -0.0340229 -0.122859  0.020340
## 1103  -0.062345 -0.0585139 -0.020285 -0.205078
## 1104  -0.178105  0.0321246  0.054873 -0.036522
## 1105  -0.062345 -0.0585139 -0.020285 -0.205078
## 1106  -0.293864  0.1227631  0.130031  0.132033
## 1107   0.005370 -0.1115340 -0.064250 -0.303676
## 1108  -0.110390 -0.0208955  0.010908 -0.135121
## 1109  -0.293864  0.1227631  0.130031  0.132033
```

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## 1110   0.352879  0.0216511 -0.239135  0.361654
## 1111   0.190710 -0.0821080 -0.162732 -0.069081
## 1112  -0.062345 -0.0585139 -0.020285 -0.205078
## 1113  -0.293864  0.1227631  0.130031  0.132033
## 1114   0.005370 -0.1115340 -0.064250 -0.303676
## 1115  -0.025079 -0.0876930 -0.044481 -0.259341
## 1116  -0.293864  0.1227631  0.130031  0.132033
## 1117  -0.110390 -0.0208955  0.010908 -0.135121
## 1118  -0.293864  0.1227631  0.130031  0.132033
## 1119  -0.025079 -0.0876930 -0.044481 -0.259341
## 1120  -0.062345 -0.0585139 -0.020285 -0.205078
## 1121  -0.025079 -0.0876930 -0.044481 -0.259341
## 1122  -0.062345 -0.0585139 -0.020285 -0.205078
## 1123  -0.293864  0.1227631  0.130031  0.132033
## 1124  -0.025079 -0.0876930 -0.044481 -0.259341
## 1125  -0.293864  0.1227631  0.130031  0.132033
## 1126   0.374228  0.0049351 -0.252996  0.330568
## 1127  -0.121892  0.1626558  0.040229  0.386093
## 1128   0.087327 -0.0011601 -0.095609  0.081453
## 1129   0.005370 -0.1115340 -0.064250 -0.303676
## 1130  -0.025079 -0.0876930 -0.044481 -0.259341
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## 1132   0.334783 -0.0203706 -0.234421  0.225602
## 1133   0.005370 -0.1115340 -0.064250 -0.303676
## 1134   0.334783 -0.0203706 -0.234421  0.225602
## 1135   0.005370 -0.1115340 -0.064250 -0.303676
## 1136   0.005370 -0.1115340 -0.064250 -0.303676
## 1137   0.005370 -0.1115340 -0.064250 -0.303676
## 1138  -0.293864  0.1227631  0.130031  0.132033
## 1139  -0.293864  0.1227631  0.130031  0.132033
## 1140  -0.025079 -0.0876930 -0.044481 -0.259341
## 1141  -0.293864  0.1227631  0.130031  0.132033
## 1142  -0.178105  0.0321246  0.054873 -0.036522
## 1143  -0.293864  0.1227631  0.130031  0.132033
## 1144  -0.293864  0.1227631  0.130031  0.132033
## 1145  -0.293864  0.1227631  0.130031  0.132033
## 1146  -0.293864  0.1227631  0.130031  0.132033
## 1147   0.005370 -0.1115340 -0.064250 -0.303676
## 1148  -0.293864  0.1227631  0.130031  0.132033
## 1149   0.339769 -0.0242743 -0.237658  0.218342
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## 1151  -0.293864  0.1227631  0.130031  0.132033
## 1152   0.268394 -0.0408313 -0.200386  0.112898
## 1153   0.162811 -0.0602634 -0.144618 -0.028458
## 1154  -0.025079 -0.0876930 -0.044481 -0.259341
## 1155   0.235968 -0.0154427 -0.179334  0.160112
## 1156  -0.293864  0.1227631  0.130031  0.132033
## 1157   0.277939 -0.0483055 -0.206584  0.098999
## 1158  -0.293864  0.1227631  0.130031  0.132033
## 1159   0.005370 -0.1115340 -0.064250 -0.303676
## 1160  -0.293864  0.1227631  0.130031  0.132033
## 1161  -0.293864  0.1227631  0.130031  0.132033
```

```
## 1162  -0.293864  0.1227631  0.130031  0.132033
## 1163   0.005370 -0.1115340 -0.064250 -0.303676
## 1164  -0.293864  0.1227631  0.130031  0.132033
## 1165  -0.121892  0.1626558  0.040229  0.386093
## 1166  -0.293864  0.1227631  0.130031  0.132033
## 1167   0.162811 -0.0602634 -0.144618 -0.028458
## 1168  -0.025079 -0.0876930 -0.044481 -0.259341
## 1169   0.146893 -0.0478003 -0.134283 -0.005281
## 1170   0.005370 -0.1115340 -0.064250 -0.303676
## 1171  -0.025079 -0.0876930 -0.044481 -0.259341
## 1172  -0.062345 -0.0585139 -0.020285 -0.205078
## 1173  -0.062345 -0.0585139 -0.020285 -0.205078
## 1174  -0.025079 -0.0876930 -0.044481 -0.259341
## 1175   0.005370 -0.1115340 -0.064250 -0.303676
## 1176  -0.293864  0.1227631  0.130031  0.132033
## 1177  -0.006133  0.0720173 -0.034930  0.217538
## 1178   0.177342 -0.0716413 -0.154053 -0.049617
## 1179  -0.025079 -0.0876930 -0.044481 -0.259341
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## 1182   0.061582  0.0189972 -0.078894  0.118939
## 1183  -0.293864  0.1227631  0.130031  0.132033
## 1184   0.005370 -0.1115340 -0.064250 -0.303676
## 1185   0.146893 -0.0478003 -0.134283 -0.005281
## 1186  -0.293864  0.1227631  0.130031  0.132033
## 1187  -0.293864  0.1227631  0.130031  0.132033
## 1188  -0.293864  0.1227631  0.130031  0.132033
## 1189   0.162811 -0.0602634 -0.144618 -0.028458
## 1190   0.091410 -0.6071076  1.394358  0.412161
## 1191  -0.293864  0.1227631  0.130031  0.132033
## 1192  -0.062345 -0.0585139 -0.020285 -0.205078
## 1193  -0.110390 -0.0208955  0.010908 -0.135121
## 1194  -0.293864  0.1227631  0.130031  0.132033
## 1195  -0.110390 -0.0208955  0.010908 -0.135121
## 1196  -0.293864  0.1227631  0.130031  0.132033
## 1197  -0.293864  0.1227631  0.130031  0.132033
## 1198  -0.293864  0.1227631  0.130031  0.132033
## 1199   0.162180  0.0423330 -0.131426  0.267554
## 1200  -0.293864  0.1227631  0.130031  0.132033
## 1201  -0.293864  0.1227631  0.130031  0.132033
## 1202  -0.293864  0.1227631  0.130031  0.132033
## 1203  -0.054177  0.1096357 -0.003736  0.287495
## 1204  -0.293864  0.1227631  0.130031  0.132033
## 1205  -0.178105  0.0321246  0.054873 -0.036522
## 1206  -0.110390 -0.0208955  0.010908 -0.135121
## 1207  -0.062345 -0.0585139 -0.020285 -0.205078
## 1208  -0.025079 -0.0876930 -0.044481 -0.259341
## 1209   0.005370 -0.1115340 -0.064250 -0.303676
## 1210  -0.025079 -0.0876930 -0.044481 -0.259341
## 1211  -0.293864  0.1227631  0.130031  0.132033
## 1212  -0.293864  0.1227631  0.130031  0.132033
## 1213  -0.293864  0.1227631  0.130031  0.132033
```

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## 1214  -0.293864  0.1227631  0.130031  0.132033
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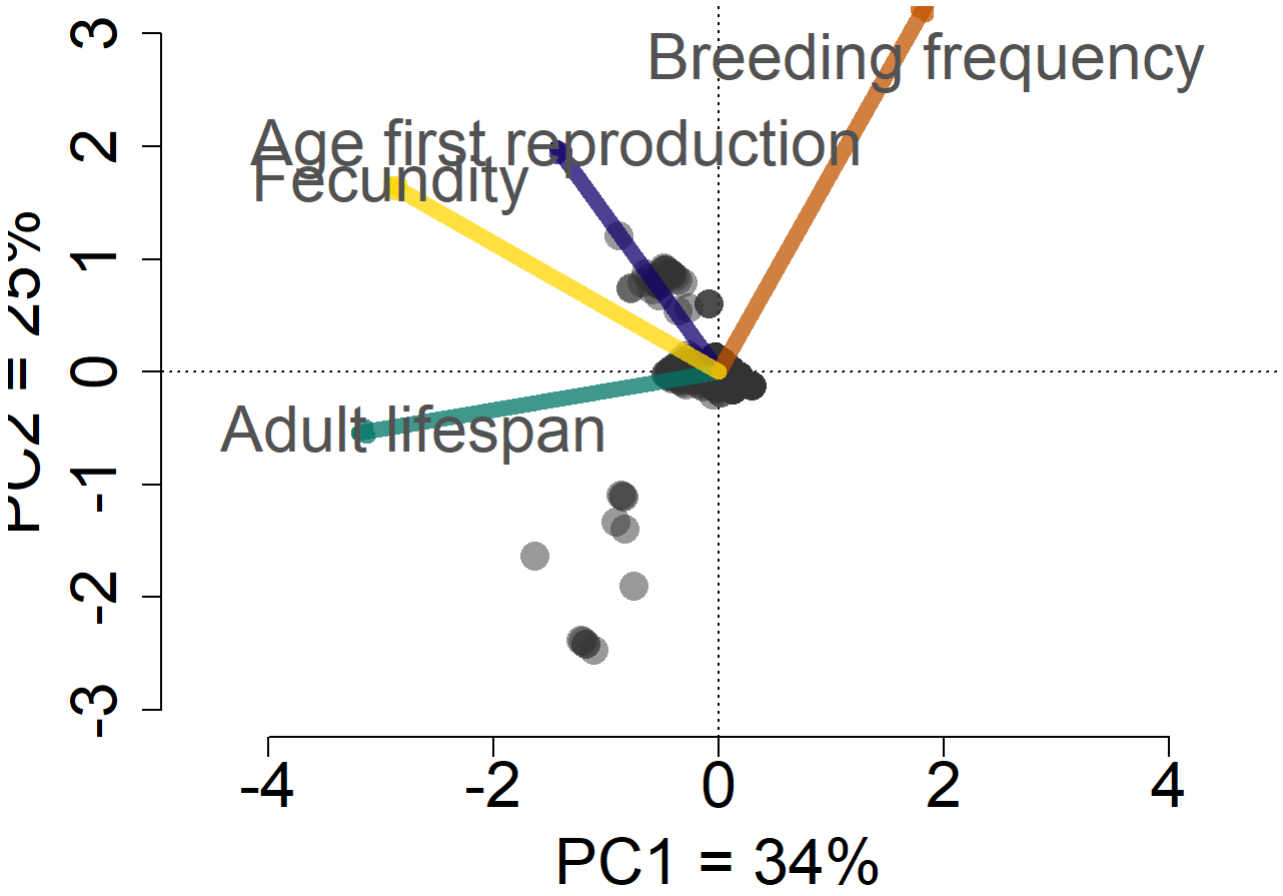
## 1216  -0.025079 -0.0876930 -0.044481 -0.259341
## 1217  -0.293864  0.1227631  0.130031  0.132033
## 1218  -0.293864  0.1227631  0.130031  0.132033
## 1219  -0.293864  0.1227631  0.130031  0.132033
## 1220  -0.293864  0.1227631  0.130031  0.132033
## 1221  -0.293864  0.1227631  0.130031  0.132033
## 1222  -0.062345 -0.0585139 -0.020285 -0.205078
## 1223  -0.293864  0.1227631  0.130031  0.132033
## 1224   0.087327 -0.0011601 -0.095609  0.081453
## 1225  -0.293864  0.1227631  0.130031  0.132033
## 1226   0.031114 -0.1316914 -0.080965 -0.341162
## 1227  -0.293864  0.1227631  0.130031  0.132033
## 1228  -0.293864  0.1227631  0.130031  0.132033
## 1229  -0.293864  0.1227631  0.130031  0.132033
## 1230  -0.293864  0.1227631  0.130031  0.132033
## 1231  -0.110390 -0.0208955  0.010908 -0.135121
## 1232  -0.062345 -0.0585139 -0.020285 -0.205078
## 1233   0.278570 -0.1509019 -0.219776 -0.197013
## 1234  -0.062345 -0.0585139 -0.020285 -0.205078
## 1235  -0.025079 -0.0876930 -0.044481 -0.259341
## 1236  -0.110390 -0.0208955  0.010908 -0.135121
## 1237   0.087327 -0.0011601 -0.095609  0.081453
## 1238  -0.293864  0.1227631  0.130031  0.132033
## 1239  -0.293864  0.1227631  0.130031  0.132033
## 1240   0.005370 -0.1115340 -0.064250 -0.303676
## 1241  -0.293864  0.1227631  0.130031  0.132033
## 1242  -0.293864  0.1227631  0.130031  0.132033
## 1243  -0.293864  0.1227631  0.130031  0.132033
## 1244  -0.293864  0.1227631  0.130031  0.132033
## 1245   0.005370 -0.1115340 -0.064250 -0.303676
## 1246  -0.178105  0.0321246  0.054873 -0.036522
## 1247  -0.293864  0.1227631  0.130031  0.132033
## 1248  -0.110390 -0.0208955  0.010908 -0.135121
## 1249  -0.293864  0.1227631  0.130031  0.132033
## 1250  -0.293864  0.1227631  0.130031  0.132033
## 1251  -0.293864  0.1227631  0.130031  0.132033
## 1252  -0.025079 -0.0876930 -0.044481 -0.259341
## 1253   0.005370 -0.1115340 -0.064250 -0.303676
## 1254  -0.025079 -0.0876930 -0.044481 -0.259341
## 1255  -0.110390 -0.0208955  0.010908 -0.135121
## 1256   0.087327 -0.0011601 -0.095609  0.081453
## 1257   0.005370 -0.1115340 -0.064250 -0.303676
## 1258  -0.293864  0.1227631  0.130031  0.132033
## 1259  -0.293864  0.1227631  0.130031  0.132033
## 1260   0.005370 -0.1115340 -0.064250 -0.303676
## 1261   0.177342 -0.0716413 -0.154053 -0.049617
## 1262  -0.293864  0.1227631  0.130031  0.132033
## 1263  -0.025079 -0.0876930 -0.044481 -0.259341
## 1264  -0.062345 -0.0585139 -0.020285 -0.205078
## 1265  -0.293864  0.1227631  0.130031  0.132033
```

```
## 1266  -0.110390 -0.0208955  0.010908 -0.135121
## 1267  -0.293864  0.1227631  0.130031  0.132033
## 1268   0.005370 -0.1115340 -0.064250 -0.303676
## 1269  -0.025079 -0.0876930 -0.044481 -0.259341
## 1270  -0.293864  0.1227631  0.130031  0.132033
## 1271   0.129298 -0.0340229 -0.122859  0.020340
## 1272   0.005370 -0.1115340 -0.064250 -0.303676
## 1273  -0.110390 -0.0208955  0.010908 -0.135121
## 1274   0.382197  0.0446073 -0.252422  0.451657
## 1275   0.310299 -0.0012002 -0.218524  0.261252
## 1276   0.277939 -0.0483055 -0.206584  0.098999
## 1277  -0.293864  0.1227631  0.130031  0.132033
## 1278  -0.110390 -0.0208955  0.010908 -0.135121
## 1279  -0.025079 -0.0876930 -0.044481 -0.259341
## 1280   0.301270  0.0058698 -0.212662  0.274400
## 1281  -0.025079 -0.0876930 -0.044481 -0.259341
## 1282   0.005370 -0.1115340 -0.064250 -0.303676
## 1283  -0.293864  0.1227631  0.130031  0.132033
## 1284   0.109627 -0.0186212 -0.110088  0.048982
## 1285  -0.025079 -0.0876930 -0.044481 -0.259341
## 1286  -0.293864  0.1227631  0.130031  0.132033
## 1287  -0.178105  0.0321246  0.054873 -0.036522
## 1288   0.031114 -0.1316914 -0.080965 -0.341162
## 1289   0.146893 -0.0478003 -0.134283 -0.005281
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_dipper1_reverse <- test.pca_dipper1
test.pca_dipper1_reverse$CA$u <- -(test.pca_dipper1_reverse$CA$u)
test.pca_dipper1_reverse$CA$v <- -(test.pca_dipper1_reverse$CA$v)
g <- vegan::scores(test.pca_dipper1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_dipper1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=c(-
3.5,3.5), main="", xlab="PC1 = 34%", ylab="PC2 = 25%", cex.lab=2, cex.axis=2)
with(data_dipper, points(test.pca_dipper1_reverse, display = "sites", col = col_points, scaling
= scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_dipper1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1]+0.5, y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2]-0.5, labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_dipper <- summary(test.pca_dipper1)

prop_dipper <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_dipper[j,i+1] <- as.numeric(abs(sum_all_dipper$species[i,j])/sum(abs(sum_all_dipper$spe
cies[i,])))
  }
}

prop_dipper
```

```
##   PC       prim      adult     breed      freq
## 1  1 0.19523693 0.43309730 0.2334169 0.3582304
## 2  2 0.26982551 0.07329361 0.4135437 0.2046272
## 3  3 0.46157243 0.16293131 0.2012361 0.1675604
## 4  4 0.07336513 0.33067778 0.1518033 0.2695820
```

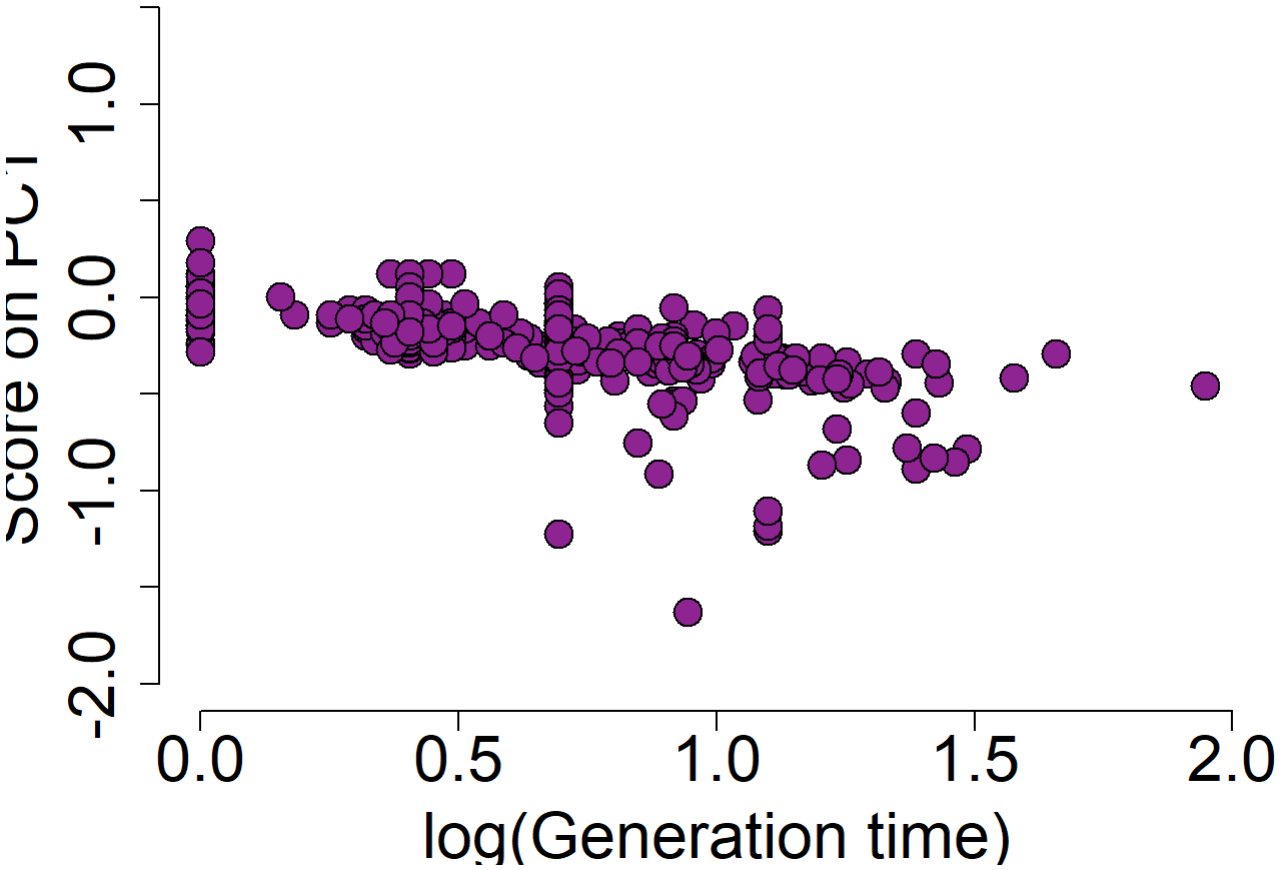
```
# Covariances
test <- as.matrix(scale(log(data_dipper[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq     fec_one
## age_first_repro      1.00000000     0.04204146 -0.05099790  0.09384486
## lifetime_adult       0.04204146     1.00000000 -0.15704439  0.26233791
## breed_freq          -0.05099790    -0.15704439  1.00000000 -0.02215099
## fec_one              0.09384486     0.26233791 -0.02215099  1.00000000
```

```
# Correlation with generation time
individual_score_dipper_reverse <- as.numeric(vegan::scores(test.pca_dipper1_reverse)$sites[,1])
summary(lm(individual_score_dipper_reverse ~ log(data_dipper$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_dipper_reverse ~ log(data_dipper$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.27746 -0.09312 -0.03743  0.17634  0.41539
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.117528   0.004929   23.85   <2e-16 ***
## log(data_dipper$generation_time) -0.497577   0.011269  -44.15   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1489 on 1287 degrees of freedom
## Multiple R-squared:  0.6023, Adjusted R-squared:  0.602
## F-statistic:  1949 on 1 and 1287 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_dipper$generation_time), individual_score_dipper_reverse, pch=21, xlab="log(Genera
tion time)", ylab="Score on PC1", xlim=c(0,2), ylim=c(-2,1.5), bg=colors[5], cex=2, cex.axis=2,
cex.lab=2)
```



House sparrow

```
data_sparrow <- data[which(data$species == "housesparrow"),]
data_sparrow$fec_one <- data_sparrow$fecundity +  1
test.pca_sparrow1 <- rda(log(data_sparrow[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_sparrow1)
```

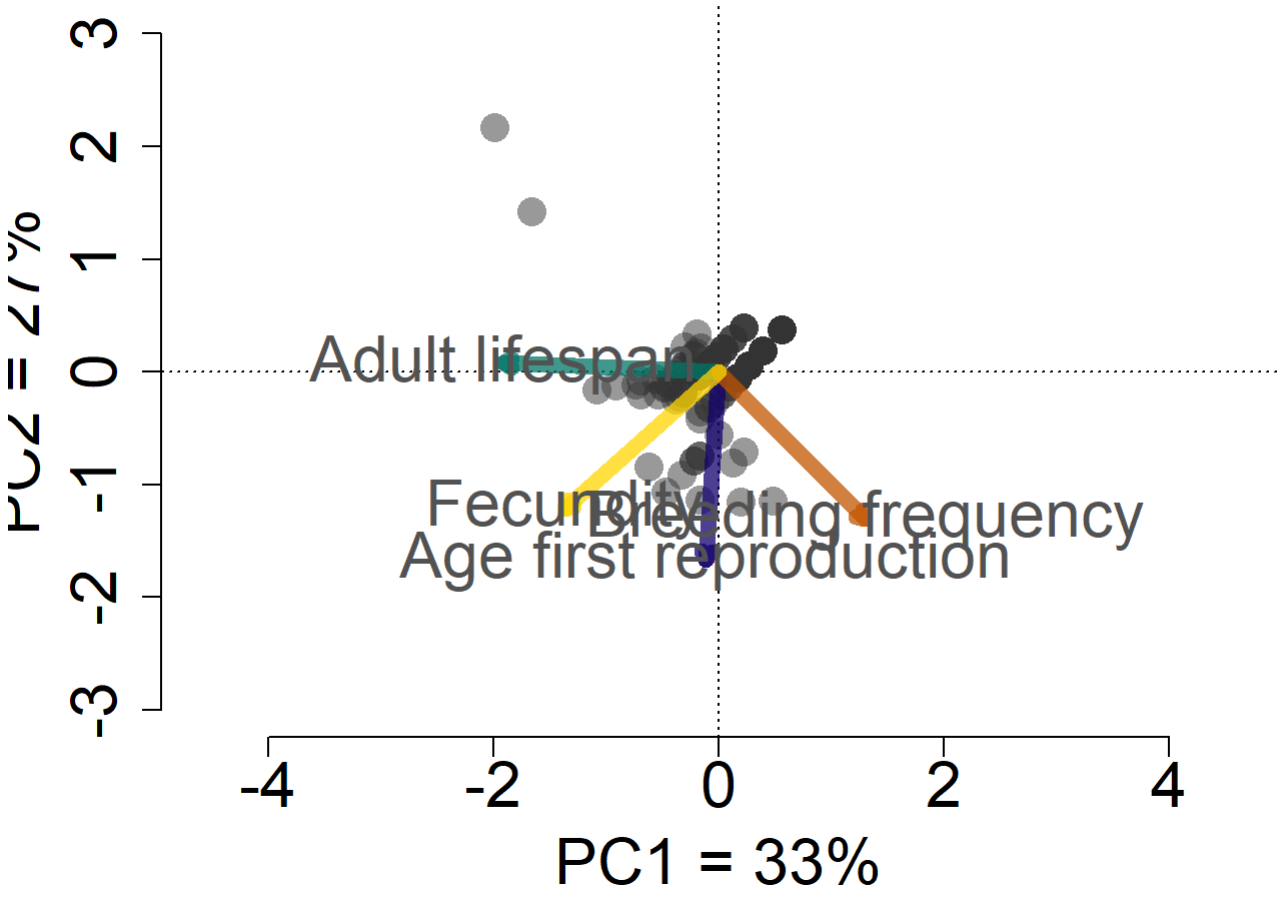
```
##
## Call:
## rda(X = log(data_sparrow[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.3038 1.0770 0.9316 0.6876
## Proportion Explained  0.3259 0.2693 0.2329 0.1719
## Cumulative Proportion 0.3259 0.5952 0.8281 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  4.709679
##
##
## Species scores
##
##                     PC1     PC2      PC3      PC4
## age_first_repro -0.1114 -1.6690 -1.65711  0.03481
## lifetime_adult  -1.9128  0.0792  0.06188  1.36985
## breed_freq       1.3000 -1.3048  1.10191  0.96873
## fec_one         -1.3670 -1.2157  1.09637 -0.99833
##
##
## Site scores (weighted sums of species scores)
##
##             PC1      PC2      PC3      PC4
## 1327  -0.470637 -1.06659 -0.33843 -0.29038
## 2126  -0.280607  0.08178  0.15255  0.44295
## 3123  -0.320246 -0.18814  0.41430 -0.16517
## 4124  -0.916203 -0.12757  0.41194  0.71885
## 5120  -0.191267  0.33920 -0.10188  0.95919
## 6120  -0.175137 -0.03193  0.25143  0.03577
## 7117  -0.377834 -0.25013  0.47894 -0.24492
## 8117   0.564844  0.37620 -0.20772  0.11475
## 9109   0.480830 -1.14734 -1.95649  0.16452
## 10116  0.564844  0.37620 -0.20772  0.11475
## 11109 -1.660944  1.42241 -1.13751 -1.10882
## 12105 -0.129699  0.01699  0.20043  0.09870
## 1328  -0.156539  0.21535  0.01329  0.61476
## 1426   0.265912  0.05439  0.12780 -0.29921
## 1527  -0.078903  0.07167  0.14342  0.16904
## 1626  -0.217144 -0.79369 -0.62295  0.06066
## 1727   0.564844  0.37620 -0.20772  0.11475
```

```
## 1827  -0.166793 -0.35100 -1.05088  1.07613
## 1925   0.564844  0.37620 -0.20772  0.11475
## 2025  -0.223019  0.14378  0.08791  0.52269
## 2127   0.564844  0.37620 -0.20772  0.11475
## 2225   0.564844  0.37620 -0.20772  0.11475
## 2325   0.265912  0.05439  0.12780 -0.29921
## 2425   0.564844  0.37620 -0.20772  0.11475
## 2525  -0.021315  0.13367  0.07878  0.24879
## 2623   0.564844  0.37620 -0.20772  0.11475
## 2723   0.169678 -0.04921  0.23582 -0.43248
## 2823  -0.171705 -0.74478 -0.67395  0.12358
## 2923   0.564844  0.37620 -0.20772  0.11475
## 3023  -0.217144 -0.79369 -0.62295  0.06066
## 3124  -0.033019 -0.26742  0.46333 -0.71317
## 3223   0.169678 -0.04921  0.23582 -0.43248
## 3323   0.091049 -0.13385  0.32407 -0.54136
## 3423   0.091049 -0.13385  0.32407 -0.54136
## 3523   0.123794  0.28988 -0.08409  0.44973
## 3620   0.169678 -0.04921  0.23582 -0.43248
## 3720   0.220029  0.39348 -0.19211  0.58300
## 3823   0.003158 -0.55653 -0.87022  0.36573
## 3920   0.265912  0.05439  0.12780 -0.29921
## 4023   0.564844  0.37620 -0.20772  0.11475
## 4125  -0.171705 -0.74478 -0.67395  0.12358
## 4223   0.220029  0.39348 -0.19211  0.58300
## 4323  -1.984404  2.16544 -1.87383 -1.57018
## 4423  -0.315126  0.04462  0.19129  0.39514
## 4523   0.169678 -0.04921  0.23582 -0.43248
## 4620   0.127671 -0.81098 -0.63856 -0.40759
## 4720   0.265912  0.05439  0.12780 -0.29921
## 4820  -0.078903  0.07167  0.14342  0.16904
## 4920  -0.330293 -0.91550 -0.49595 -0.09603
## 5020   0.389980  0.18795 -0.01145 -0.12740
## 5123  -0.561056 -0.05889  0.31318  0.44710
## 5220  -1.078617 -0.16156  0.45957  0.83684
## 5320   0.389980  0.18795 -0.01145 -0.12740
## 5420  -0.320246 -0.18814  0.41430 -0.16517
## 5520  -0.694966 -0.07799  0.34391  0.56613
## 5620  -0.455470 -0.10646  0.34882  0.20080
## 5720  -0.175137 -0.03193  0.25143  0.03577
## 5820   0.389980  0.18795 -0.01145 -0.12740
## 5920  -0.622234 -0.84130 -0.53969  0.44544
## 6020   0.564844  0.37620 -0.20772  0.11475
## 6123   0.389980  0.18795 -0.01145 -0.12740
## 6219  -0.320246 -0.18814  0.41430 -0.16517
## 6319   0.265912  0.05439  0.12780 -0.29921
## 6419   0.265912  0.05439  0.12780 -0.29921
## 6518   0.265912  0.05439  0.12780 -0.29921
## 6618   0.564844  0.37620 -0.20772  0.11475
## 6718  -0.171260 -1.13278 -0.30304 -0.82155
## 6818   0.389980  0.18795 -0.01145 -0.12740
## 6918  -0.223019  0.14378  0.08791  0.52269
```

```
## 7017  -0.376841 -0.02182  0.26056  0.30968
## 7118   0.169678 -0.04921  0.23582 -0.43248
## 7217   0.045165  0.20524  0.00416  0.34085
## 7317   0.123794  0.28988 -0.08409  0.44973
## 7417  -0.201977  0.16643  0.06429  0.55183
## 7517   0.265912  0.05439  0.12780 -0.29921
## 7617  -0.299650  0.22252  0.01977  0.80910
## 7717   0.123794  0.28988 -0.08409  0.44973
## 7817  -0.478788 -0.13156  0.37499  0.16851
## 7917   0.024569 -0.20542  0.39869 -0.63342
## 8017   0.265912  0.05439  0.12780 -0.29921
## 8118  -0.694816 -0.20289  0.46331  0.26187
## 8216  -0.489990 -0.14362  0.38756  0.15299
## 8317  -0.732904 -0.11883  0.38649  0.51359
## 8417  -0.542013 -0.19963  0.44595  0.08095
## 8516   0.024569 -0.20542  0.39869 -0.63342
## 8617   0.265912  0.05439  0.12780 -0.29921
## 8716   0.564844  0.37620 -0.20772  0.11475
## 8817   0.169678 -0.04921  0.23582 -0.43248
## 8917   0.265912  0.05439  0.12780 -0.29921
## 9017   0.223905 -0.70738 -0.74658 -0.27432
## 9117  -0.083815 -0.32210  0.52034 -0.78351
## 9216  -0.175137 -0.03193  0.25143  0.03577
## 9316  -0.021315  0.13367  0.07878  0.24879
## 9415   0.564844  0.37620 -0.20772  0.11475
## 9515  -0.347087  0.01022  0.22717  0.35089
## 9615  -0.129699  0.01699  0.20043  0.09870
## 9716   0.265912  0.05439  0.12780 -0.29921
## 9816  -0.170357 -0.41527  0.61748 -0.90336
## 9916  -0.078903  0.07167  0.14342  0.16904
## 10016  0.265912  0.05439  0.12780 -0.29921
## 10117  0.265912  0.05439  0.12780 -0.29921
## 10216  0.169678 -0.04921  0.23582 -0.43248
## 10316 -0.175137 -0.03193  0.25143  0.03577
## 10416  0.564844  0.37620 -0.20772  0.11475
## 10516 -0.021315  0.13367  0.07878  0.24879
## 10616  0.045165  0.20524  0.00416  0.34085
## 10716  0.220029  0.39348 -0.19211  0.58300
## 10816  0.199333 -1.15298 -1.25806 -0.25977
## 10915 -0.078903  0.07167  0.14342  0.16904
## 11015  0.045165  0.20524  0.00416  0.34085
## 11115 -0.253766 -0.11657  0.33969 -0.07311
## 11215 -0.455470 -0.10646  0.34882  0.20080
## 11314 -0.078903  0.07167  0.14342  0.16904
## 11415  0.220029  0.39348 -0.19211  0.58300
## 11515  0.169678 -0.04921  0.23582 -0.43248
## 11615 -0.083815 -0.32210  0.52034 -0.78351
## 11715  0.265912  0.05439  0.12780 -0.29921
## 11815 -0.175137 -0.03193  0.25143  0.03577
## 11915  0.389980  0.18795 -0.01145 -0.12740
## 12015  0.389980  0.18795 -0.01145 -0.12740
## 12115  0.389980  0.18795 -0.01145 -0.12740
```

```
## 12215  0.045165  0.20524  0.00416  0.34085
## 12315 -0.350001 -0.22017  0.44770 -0.20638
## 12414  0.169678 -0.04921  0.23582 -0.43248
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_sparrow1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), xlim=c
(-3.5,3.5), xlab="PC1 = 33%", ylab="PC2 = 27%", cex.lab=2, cex.axis=2)
with(data_sparrow, points(test.pca_sparrow1, display = "sites", col = col_points, scaling = scl,
pch = 16, cex=2))
g <- vegan::scores(test.pca_sparrow1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```



```r
# Test for proportion of variance explained per axe
sum_all_sparrow <- summary(test.pca_sparrow1)

prop_sparrow <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_sparrow[j,i+1] <- as.numeric(abs(sum_all_sparrow$species[i,j])/sum(abs(sum_all_sparrow
$species[i,])))
  }
}

prop_sparrow
```

```
##   PC       prim      adult     breed      freq
## 1  1 0.03208581 0.55868552 0.2780457 0.2922582
## 2  2 0.48066141 0.02313258 0.2790827 0.2599057
## 3  3 0.47722855 0.01807415 0.2356775 0.2343976
## 4  4 0.01002423 0.40010775 0.2071941 0.2134385
```

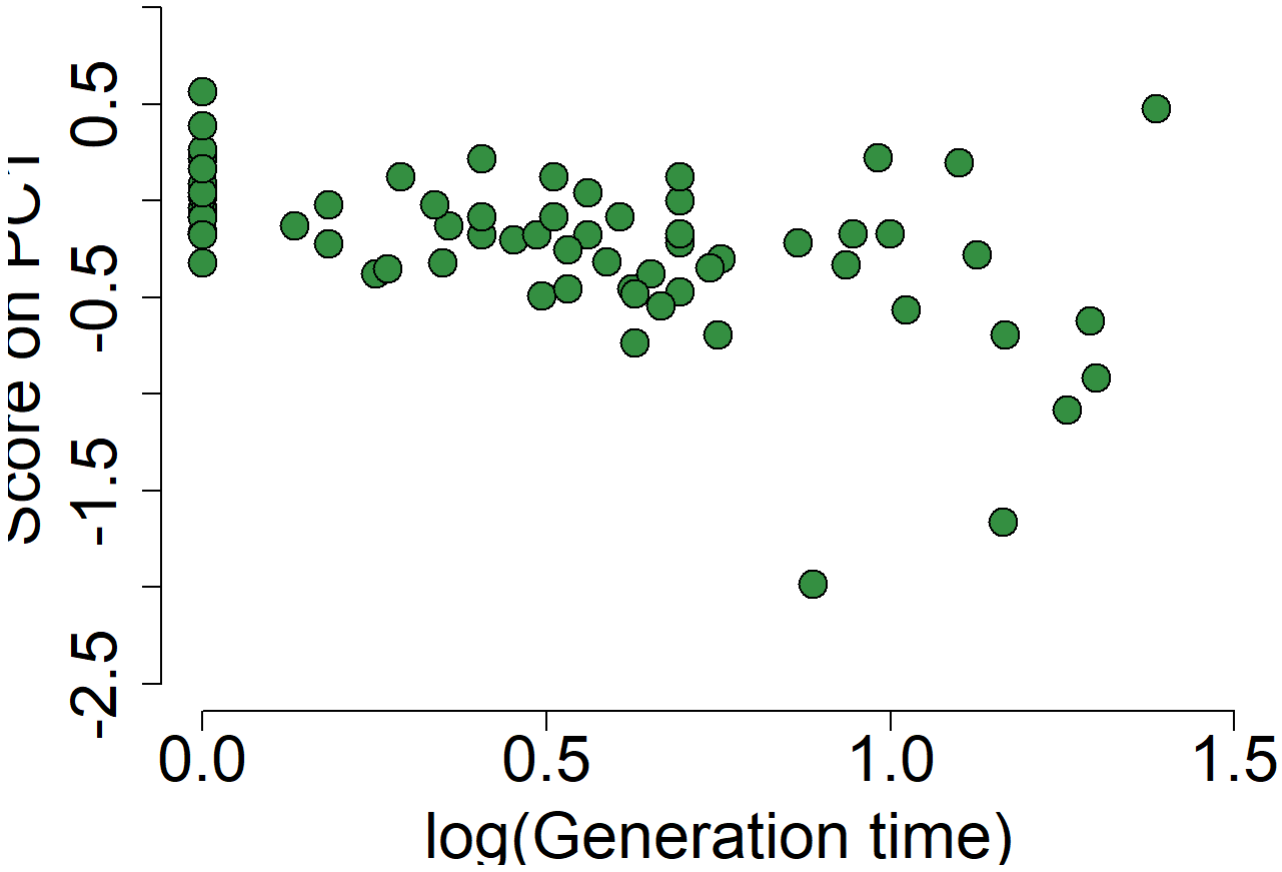
```r
# Covariances
test <- as.matrix(scale(log(data_sparrow[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult   breed_freq     fec_one
## age_first_repro     1.000000000    0.004699795  0.043411674 0.059466064
## lifetime_adult      0.004699795    1.000000000 -0.215451747 0.219784074
## breed_freq          0.043411674   -0.215451747  1.000000000 0.009043238
## fec_one             0.059466064    0.219784074  0.009043238 1.000000000
```

```r
# Correlation with generation time
individual_score_sparrow <- as.numeric(vegan::scores(test.pca_sparrow1)$sites[,1])
summary(lm(individual_score_sparrow ~ log(data_sparrow$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_sparrow ~ log(data_sparrow$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.57081 -0.17260  0.01211  0.17222  1.24947
##
## Coefficients:
##                                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       0.21776    0.03674   5.927 2.93e-08 ***
## log(data_sparrow$generation_time) -0.71154    0.07412  -9.601  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3218 on 122 degrees of freedom
## Multiple R-squared:  0.4304, Adjusted R-squared:  0.4257
## F-statistic: 92.17 on 1 and 122 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_sparrow$generation_time), individual_score_sparrow, pch=21, xlab="log(Generation t
ime)", ylab="Score on PC1", xlim=c(0,1.5), ylim=c(-2.5,1), bg=colors[8], cex=2, cex.axis=2, cex.
lab=2)
```



Blue tits

```
data_btits <- data[which(data$species == "bluetits"),]
data_btits$fec_one <- data_btits$fecundity +  1
test.pca_btits1 <- rda(log(data_btits[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_btits1)
```

```
##
## Call:
## rda(X = log(data_btits[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               3          1
## Unconstrained       3          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3
## Eigenvalue            1.1615 1.0246 0.8139
## Proportion Explained  0.3872 0.3415 0.2713
## Cumulative Proportion 0.3872 0.7287 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  5.174636
##
##
## Species scores
##
##                     PC1     PC2     PC3
## age_first_repro 0.05488  2.8415 -0.9211
## lifetime_adult  2.28455  0.6939  1.7958
## breed_freq      0.00000  0.0000  0.0000
## fec_one         2.26830 -0.7676 -1.7864
##
##
## Site scores (weighted sums of species scores)
##
##             PC1       PC2       PC3
## 1329  -0.104166 -0.096594 -0.234119
## 2128   0.065252  0.077571  0.313277
## 3125  -0.263287 -0.035550 -0.055279
## 4126  -0.376185  0.007760  0.071609
## 5124   0.440014  0.172960  0.629882
## 6124   0.111475  0.059839  0.261326
## 7119   0.653350  0.091118  0.390108
## 8119  -0.047646  0.120882  0.440165
## 9118   0.111475  0.059839  0.261326
## 10118  0.288847  0.131692  0.493564
## 11116 -0.047646  0.120882  0.440165
## 12106 -0.104166 -0.096594 -0.234119
## 1330   0.008732 -0.139905 -0.361007
## 1427   0.477051  0.059492  0.282037
## 1528   0.065252  0.077571  0.313277
## 1627   0.008732 -0.139905 -0.361007
## 1728  -0.104166 -0.096594 -0.234119
```

```
## 1828  -0.535306  0.068804  0.250449
## 1926   0.437774  0.074560  0.326181
## 2026  -0.263287 -0.035550 -0.055279
## 2129   0.536210  0.136056  0.521765
## 2226   0.370333  0.100432  0.401980
## 2326   0.730228  0.138617  0.541225
## 2426   0.284868 -0.006680  0.066446
## 2526   0.054955 -0.157637 -0.412958
## 2624   0.627178  0.101158  0.419524
## 2724  -0.043671 -0.119801 -0.302110
## 2824  -0.043671 -0.119801 -0.302110
## 2924   0.311943 -0.017067  0.036015
## 3024   0.190226  0.029627  0.172816
## 3126   0.190226  0.029627  0.172816
## 3224  -0.104166 -0.096594 -0.234119
## 3324   0.255785  0.004477  0.099133
## 3424  -0.043671 -0.119801 -0.302110
## 3524  -0.807325  0.173158  0.556176
## 3623   0.008732 -0.139905 -0.361007
## 3723   0.337271 -0.026783  0.007549
## 3824  -0.043671 -0.119801 -0.302110
## 3923   0.223288  0.156842  0.567246
## 4024   0.008732 -0.139905 -0.361007
## 4127   0.284868 -0.006680  0.066446
## 4224   0.008732 -0.139905 -0.361007
## 4324  -0.376185  0.007760  0.071609
## 4424  -0.807325  0.173158  0.556176
## 4524   0.284868 -0.006680  0.066446
## 4623  -0.175716 -0.069145 -0.153702
## 4723  -0.807325  0.173158  0.556176
## 4823   0.394124  0.091305  0.375240
## 4923   0.054955 -0.157637 -0.412958
## 5023   0.008732 -0.139905 -0.361007
## 5125  -0.175716 -0.069145 -0.153702
## 5223   0.255785  0.004477  0.099133
## 5323   0.152823  0.043976  0.214854
## 5423  -0.807325  0.173158  0.556176
## 5523   0.223288  0.156842  0.567246
## 5623  -0.807325  0.173158  0.556176
## 5723  -0.807325  0.173158  0.556176
## 5823   0.008732 -0.139905 -0.361007
## 5923  -0.104166 -0.096594 -0.234119
## 6023   0.224373  0.016528  0.134437
## 6125  -0.807325  0.173158  0.556176
## 6220  -0.807325  0.173158  0.556176
## 6320   0.008732 -0.139905 -0.361007
## 6420   0.394124  0.091305  0.375240
## 6519  -0.807325  0.173158  0.556176
## 6619  -0.043671 -0.119801 -0.302110
## 6719  -0.175716 -0.069145 -0.153702
## 6819   0.383494 -0.044516 -0.044402
## 6919  -0.175716 -0.069145 -0.153702
```

```
## 7018  -0.043671 -0.119801 -0.302110
## 7120   0.568932  0.123503  0.484988
## 7218  -0.104166 -0.096594 -0.234119
## 7318   0.096303 -0.173499 -0.459429
## 7418   0.190226  0.029627  0.172816
## 7518  -0.104166 -0.096594 -0.234119
## 7618  -0.175716 -0.069145 -0.153702
## 7718  -0.263287 -0.035550 -0.055279
## 7818  -0.104166 -0.096594 -0.234119
## 7918  -0.376185  0.007760  0.071609
## 8018  -0.535306  0.068804  0.250449
## 8120   0.552912  0.129649  0.502993
## 8217  -0.175716 -0.069145 -0.153702
## 8318  -0.535306  0.068804  0.250449
## 8418  -0.175716 -0.069145 -0.153702
## 8517   0.152823  0.043976  0.214854
## 8618  -0.043671 -0.119801 -0.302110
## 8717  -0.175716 -0.069145 -0.153702
## 8818   0.094852  4.911393 -1.592013
## 8918  -0.043671 -0.119801 -0.302110
## 9018  -0.175716 -0.069145 -0.153702
## 9119  -0.263287 -0.035550 -0.055279
## 9217  -0.175716 -0.069145 -0.153702
## 9317  -0.206767  0.181925  0.619005
## 9416   0.370333  0.100432  0.401980
## 9516  -0.043671 -0.119801 -0.302110
## 9616   0.012849  0.097674  0.372174
## 9717   0.345005  0.110148  0.430446
## 9817  -0.263287 -0.035550 -0.055279
## 9917  -0.535306  0.068804  0.250449
## 10017  0.255785  0.004477  0.099133
## 10119  0.337271 -0.026783  0.007549
## 10217  0.054955 -0.157637 -0.412958
## 10317  0.111475  0.059839  0.261326
## 10417  0.008732 -0.139905 -0.361007
## 10517 -0.535306  0.068804  0.250449
## 10617 -0.175716 -0.069145 -0.153702
## 10717  0.224373  0.016528  0.134437
## 10817 -0.175716 -0.069145 -0.153702
## 10916 -0.043671 -0.119801 -0.302110
## 11016  0.311943 -0.017067  0.036015
## 11117  0.054955 -0.157637 -0.412958
## 11216  0.054955 -0.157637 -0.412958
## 11315 -0.104166 -0.096594 -0.234119
## 11416  0.255785  0.004477  0.099133
## 11516 -0.104166 -0.096594 -0.234119
## 11616 -0.175716 -0.069145 -0.153702
## 11716  0.152823  0.043976  0.214854
## 11816 -0.104166 -0.096594 -0.234119
## 11916 -0.104166 -0.096594 -0.234119
## 12016  0.284868 -0.006680  0.066446
## 12116  0.255785  0.004477  0.099133
```

```
## 12216 -0.175716 -0.069145 -0.153702
## 12316  0.054955 -0.157637 -0.412958
## 12415 -0.263287 -0.035550 -0.055279
## 12515  0.560866  0.027338  0.187836
## 12615  0.361063 -0.035910 -0.019191
## 12715 -0.104166 -0.096594 -0.234119
## 12815  0.008732 -0.139905 -0.361007
## 12913  0.255785  0.004477  0.099133
## 13010  0.284868 -0.006680  0.066446
## 13112 -0.104166 -0.096594 -0.234119
## 13210  0.311943 -0.017067  0.036015
## 1336   0.054955 -0.157637 -0.412958
## 1346  -0.175716 -0.069145 -0.153702
## 1356  -0.043671 -0.119801 -0.302110
## 1366  -0.043671 -0.119801 -0.302110
## 1376  -0.104166 -0.096594 -0.234119
## 1386   0.008732 -0.139905 -0.361007
## 1396   0.008732 -0.139905 -0.361007
## 1406  -0.043671 -0.119801 -0.302110
## 14112  0.008732 -0.139905 -0.361007
## 1428   0.054955 -0.157637 -0.412958
## 1436   0.008732 -0.139905 -0.361007
## 1446  -0.104166 -0.096594 -0.234119
## 1456  -0.807325  0.173158  0.556176
## 1466   0.416556  0.082699  0.350029
## 1476  -0.807325  0.173158  0.556176
## 1486   0.512752  0.045796  0.241912
## 1496   0.512752  0.045796  0.241912
## 1506  -0.263287 -0.035550 -0.055279
## 15112 -0.807325  0.173158  0.556176
## 1529  -0.104166 -0.096594 -0.234119
## 1536  -0.807325  0.173158  0.556176
## 1546  -0.104166 -0.096594 -0.234119
## 1556   0.337271 -0.026783  0.007549
## 1566   0.734039  0.200062  0.731010
## 1576   0.152823  0.043976  0.214854
## 1586   0.255785  0.004477  0.099133
## 1595  -0.104166 -0.096594 -0.234119
## 1606  -0.807325  0.173158  0.556176
## 16112 -0.175716 -0.069145 -0.153702
## 1628   0.008732 -0.139905 -0.361007
## 1635  -0.104166 -0.096594 -0.234119
## 1646  -0.104166 -0.096594 -0.234119
## 1656   0.512752  0.045796  0.241912
## 1666   0.500509  0.149752  0.561890
## 1676  -0.043671 -0.119801 -0.302110
## 1686   0.311943 -0.017067  0.036015
## 1696  -0.263287 -0.035550 -0.055279
## 1706   0.284868 -0.006680  0.066446
## 17112 -0.807325  0.173158  0.556176
## 1729   0.152823  0.043976  0.214854
## 1735  -0.807325  0.173158  0.556176
```

```
## 1746  -0.043671 -0.119801 -0.302110
## 1756   0.416556  0.082699  0.350029
## 1766   0.008732 -0.139905 -0.361007
## 1776   0.613407  0.106442  0.435002
## 1786   0.008732 -0.139905 -0.361007
## 1796   0.008732 -0.139905 -0.361007
## 1805  -0.104166 -0.096594 -0.234119
## 18112 -0.104166 -0.096594 -0.234119
## 1829   0.394124  0.091305  0.375240
## 1836  -0.104166 -0.096594 -0.234119
## 1846  -0.263287 -0.035550 -0.055279
## 1856  -0.807325  0.173158  0.556176
## 1866   0.599134  0.111917  0.451043
## 1876  -0.807325  0.173158  0.556176
## 1885   0.008732 -0.139905 -0.361007
## 1895   0.529454  0.039389  0.223140
## 1905   0.111475  0.059839  0.261326
## 19112 -0.043671 -0.119801 -0.302110
## 1927  -0.104166 -0.096594 -0.234119
## 1935   0.477051  0.059492  0.282037
## 1945   0.311943 -0.017067  0.036015
## 1955  -0.043671 -0.119801 -0.302110
## 1965  -0.104166 -0.096594 -0.234119
## 1975   0.311943 -0.017067  0.036015
## 1985  -0.104166 -0.096594 -0.234119
## 1995   0.054955 -0.157637 -0.412958
## 2005   0.416556  0.082699  0.350029
## 20112  0.640482  0.096055  0.404571
## 2027   0.152823  0.043976  0.214854
## 2035  -0.263287 -0.035550 -0.055279
## 2045  -0.175716 -0.069145 -0.153702
## 2055   0.190226  0.029627  0.172816
## 2065   0.255785  0.004477  0.099133
## 2075   0.096303 -0.173499 -0.459429
## 2085   0.223288  0.156842  0.567246
## 2095   0.311943 -0.017067  0.036015
## 21011  0.152823  0.043976  0.214854
## 21112  0.008732 -0.139905 -0.361007
## 21210 -0.043671 -0.119801 -0.302110
## 2135  -0.175716 -0.069145 -0.153702
## 2145   0.284868 -0.006680  0.066446
## 2155   0.284868 -0.006680  0.066446
## 2165   0.255785  0.004477  0.099133
## 2175  -0.175716 -0.069145 -0.153702
## 2185  -0.043671 -0.119801 -0.302110
## 2195   0.284868 -0.006680  0.066446
## 2205   0.008732 -0.139905 -0.361007
## 22112  0.345005  0.110148  0.430446
## 2227  -0.043671 -0.119801 -0.302110
## 2235   0.190226  0.029627  0.172816
## 2245   0.190226  0.029627  0.172816
## 2255  -0.263287 -0.035550 -0.055279
```

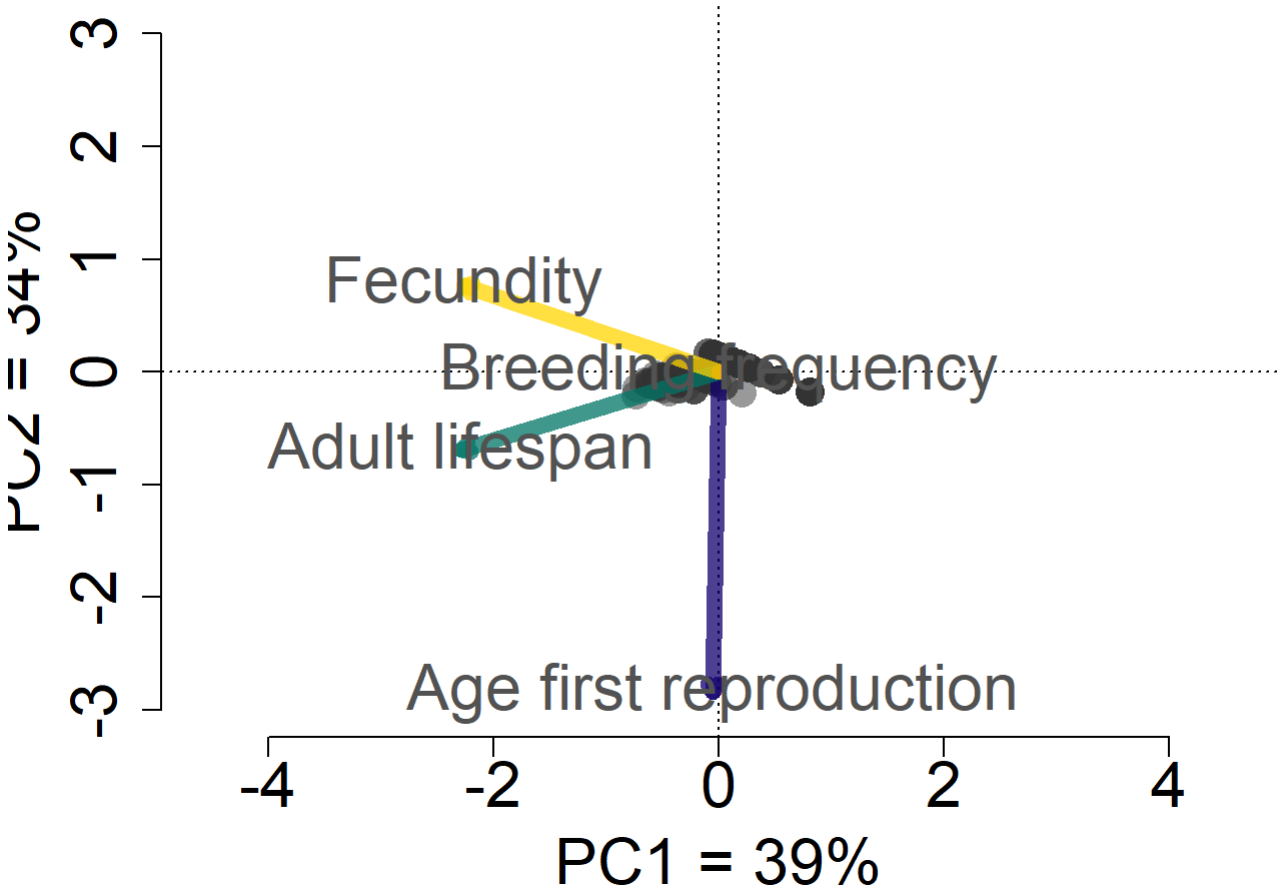
```
## 2265  -0.043671 -0.119801 -0.302110
## 2275   0.111475  0.059839  0.261326
## 2285  -0.104166 -0.096594 -0.234119
## 2295  -0.104166 -0.096594 -0.234119
## 2305   0.008732 -0.139905 -0.361007
## 23112  0.008732 -0.139905 -0.361007
## 2327   0.008732 -0.139905 -0.361007
## 2335   0.008732 -0.139905 -0.361007
## 2345   0.008732 -0.139905 -0.361007
## 2355  -0.043671 -0.119801 -0.302110
## 2365   0.008732 -0.139905 -0.361007
## 2375  -0.043671 -0.119801 -0.302110
## 2385  -0.104166 -0.096594 -0.234119
## 2395  -0.043671 -0.119801 -0.302110
## 2405  -0.175716 -0.069145 -0.153702
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_btits1_reverse <- test.pca_btits1
test.pca_btits1_reverse$CA$u <- -(test.pca_btits1_reverse$CA$u)
test.pca_btits1_reverse$CA$v <- -(test.pca_btits1_reverse$CA$v)
g <- vegan::scores(test.pca_btits1_reverse, display = "species", scaling=2)


# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_btits1_reverse,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), x
lim=c(-3.5,3.5), xlab="PC1 = 39%", ylab="PC2 = 34%", cex.lab=2, cex.axis=2)
with(data_btits, points(test.pca_btits1_reverse, display = "sites", col = col_points, scaling =
scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_btits1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
```

```
## Warning in arrows(0, 0, len * g[, 1], len * g[, 2], length = 0.05, col =
## c(col_afr, : zero-length arrow is of indeterminate angle and so skipped
```

```
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_btits <- summary(test.pca_btits1)

prop_btits <- data.frame(
  PC = c(1:3),
  prim = c(1:3),
  adult = c(1:3),
  breed = c(1:3),
  freq = c(1:3)
)


for (i in 1:4) {
  for (j in 1:3){
    prop_btits[j,i+1] <- as.numeric(abs(sum_all_btits$species[i,j])/sum(abs(sum_all_btits$specie
s[i,])))
  }
}

prop_btits
```

```
##   PC       prim     adult breed      freq
## 1  1 0.01437523 0.4785170   NaN 0.4703781
## 2  2 0.74434692 0.1453326   NaN 0.1591714
## 3  3 0.24127785 0.3761504   NaN 0.3704505
```

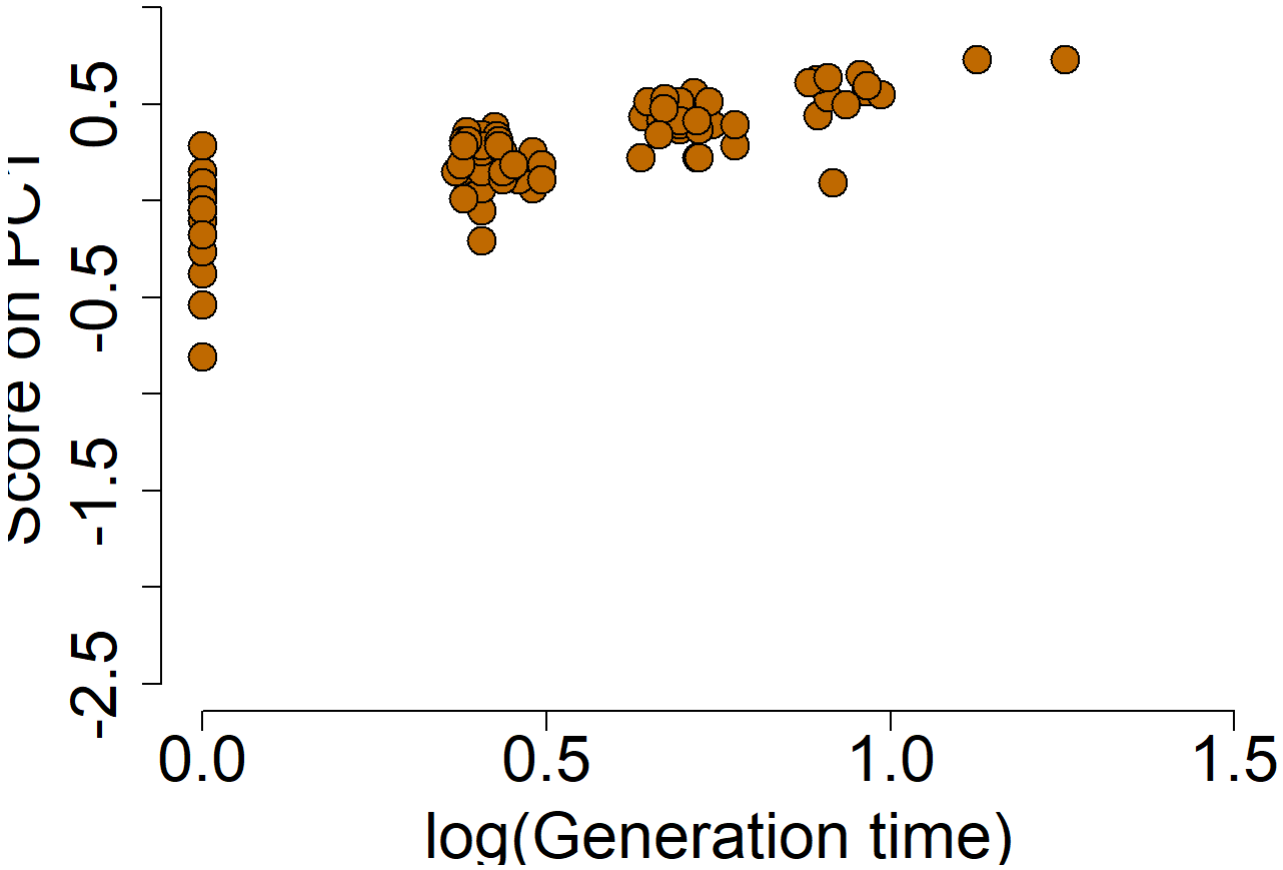
```
# Covariances
test <- as.matrix(scale(log(data_btits[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq    fec_one
## age_first_repro      1.00000000     0.04961868         NA -0.0460664
## lifetime_adult       0.04961868     1.00000000         NA  0.1614858
## breed_freq                   NA             NA         NA         NA
## fec_one             -0.04606640     0.16148583         NA  1.0000000
```

```
# Correlation with generation time
individual_score_btits <- as.numeric(vegan::scores(test.pca_btits1)$sites[,1])
summary(lm(individual_score_btits ~ log(data_btits$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_btits ~ log(data_btits$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.64009 -0.04288  0.06307  0.12418  0.45210
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                    -0.16724    0.01764  -9.481   <2e-16 ***
## log(data_btits$generation_time)  0.81981    0.04853  16.894   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2262 on 238 degrees of freedom
## Multiple R-squared:  0.5453, Adjusted R-squared:  0.5434
## F-statistic: 285.4 on 1 and 238 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_btits$generation_time), individual_score_btits, pch=21, xlab="log(Generation tim
e)", ylab="Score on PC1", xlim=c(0,1.5), ylim=c(-2.5,1), bg=colors[4], cex=2, cex.axis=2, cex.la
b=2)
```



Red-Billed gull

```
data_gull <- data[which(data$species == "redbilledgull"),]
data_gull$fec_one <- data_gull$fecundity +  1
test.pca_gull1 <- rda(log(data_gull[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_gull1)
```

```
##
## Call:
## rda(X = log(data_gull[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.5620 1.2103 0.7970 0.4308
## Proportion Explained  0.3905 0.3026 0.1992 0.1077
## Cumulative Proportion 0.3905 0.6931 0.8923 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  7.21643
##
##
## Species scores
##
##                     PC1     PC2     PC3     PC4
## age_first_repro  1.4191 -2.3456  2.2897  0.5110
## lifetime_adult  -0.2279  3.0252  1.7939  0.7727
## breed_freq      -3.0424 -0.9979 -0.3798  1.6196
## fec_one         -3.0023 -0.3272  1.3309 -1.4584
##
##
## Site scores (weighted sums of species scores)
##
##              PC1        PC2        PC3        PC4
## 1360   0.5153689  0.5777575  0.1715935 -5.016e-01
## 2149  -0.4200862 -0.0185366  0.0438268 -6.826e-02
## 3136   0.1455123  0.3390855  0.0242793  9.015e-02
## 4137  -0.2011384 -0.0179012  0.0744151  1.227e-01
## 5135  -0.2530902  0.0224110  0.2962613  2.205e-01
## 6135   0.2261179 -0.0267863  0.4100324  2.903e-01
## 7128   0.0093645  0.2877259  0.0682028  3.568e-02
## 8128  -0.1562925  0.0839678 -0.3825609  3.772e-01
## 9127   0.0005398 -0.1278434  0.2647115  1.709e-01
## 10127  0.0665967 -0.8699872 -0.6818693  2.638e-01
## 11124 -0.0691898 -0.2613080 -0.1301734  3.182e-01
## 12120  0.1035027  0.0262560  0.3043146 -1.436e-01
## 1370   0.0531113  0.3816502 -0.1812526  2.600e-01
## 1440  -0.0555391  0.1488989 -0.2701482 -1.083e-01
## 1550  -0.0565968 -0.0865003  0.0442581  3.041e-01
## 1640  -0.0998082 -0.0220235  0.1826037  1.001e-01
## 1740   0.2410832  0.0978768  0.0921243  1.092e-01
```

```
## 1850  -0.1211563 -0.1365624  0.2374754  3.243e-02
## 1938   0.1625321 -0.0799831 -0.0250799  3.609e-02
## 2038  -0.0066788 -0.2414075  0.3524219  2.098e-01
## 2150  -0.4814030  0.0824977  0.3902453 -5.324e-02
## 2238  -0.2283908 -0.0375491  0.1283805 -1.336e-01
## 2338  -0.4125549  0.2751761  0.0618843 -2.497e-02
## 2437   0.0592927  0.0457217  0.3048821  6.599e-02
## 2535   0.0960123  0.2901334 -0.0455942  3.160e-01
## 2630  -0.2283908 -0.0375491  0.1283805 -1.336e-01
## 2730   0.0585523  0.2559429 -0.5520044 -3.666e-01
## 2830   0.0315217 -0.3283530  0.0196283  2.626e-01
## 2930   0.0215767  0.2516551 -0.6459980  1.376e-01
## 3029  -0.0320406  0.1260085  0.2754120  1.756e-01
## 3137  -0.4397088 -0.0126709  0.0948504 -2.155e-01
## 3229  -0.0155703  0.2202354 -0.0477499  3.147e-01
## 3329  -0.2044638 -0.0888181  0.1529247  2.172e-01
## 3429  -0.4058029  0.3607223 -0.2189515 -8.835e-02
## 3529  -0.0760729 -0.0497607  0.2603815  2.030e-01
## 3628  -0.1296553 -0.1323222 -0.3213732  2.393e-01
## 3728  -0.1855602  0.3483493 -0.1225912  5.071e-01
## 3829  -0.1177892  0.1138037  0.2968175  2.618e-01
## 3928   0.1189865 -0.3320652  0.1630039  2.934e-01
## 4029  -0.1176961  0.2414757 -0.1742623  5.960e-02
## 4138  -0.3905765  0.3775593 -0.1742943 -2.535e-01
## 4229  -0.0348588  0.1668644 -0.0288335  3.852e-02
## 4329   0.0969242  0.1741097 -0.1877912  4.181e-01
## 4429  -0.4096313 -0.1493904  0.1624654 -2.964e-01
## 4529  -0.0540087 -0.1590461  0.3119989 -3.275e-02
## 4628  -0.3431568  0.0034499  0.1983001  6.006e-02
## 4728  -0.2895133 -0.0052846  0.1653261  1.873e-02
## 4828   0.2706719 -0.2139981 -0.0199284  3.006e-01
## 4928  -0.5820999 -0.2871438  0.3480717 -5.189e-01
## 5028   0.0334025  0.0585847  0.4213796  2.334e-01
## 5136  -0.4679656  0.2462847  0.3459864 -7.362e-02
## 5228  -0.4520223  0.1214430  0.1840803  3.453e-02
## 5328   0.2675771 -0.0355162  0.0006194 -1.667e-01
## 5428  -0.4398386  0.2120736  0.0292504 -9.263e-02
## 5528  -0.6598907  0.6935585 -0.3041073 -3.721e-01
## 5628   0.1228072  0.2023907 -0.1132188  1.418e-01
## 5728   0.7165890  0.5893477  0.1003237 -6.878e-01
## 5828   0.2352144 -0.0139041 -0.3740529  5.572e-03
## 5928   0.2690503  0.3407191  0.0218824 -2.347e-01
## 6028   0.0349720  0.2594296 -0.0241657  2.486e-01
## 6136  -0.2566602 -0.1441207  0.2042839 -1.219e-01
## 6227  -0.2965964 -0.1610262  0.1945135 -4.480e-02
## 6327   0.1406624  0.2259286  0.1845741 -2.009e-01
## 6427  -0.2632741  0.1877905  0.1179856  1.111e-01
## 6526   0.6031663 -0.0068006  0.4351328 -1.506e-02
## 6626  -0.2444674  0.0796862  0.2191726  4.239e-02
## 6725   0.0382000  0.5432922 -0.1942198 -5.942e-01
## 6825  -0.3864826 -0.0102970  0.2835475 -2.647e-01
## 6925  -0.0481066  0.2263446  0.2380265  8.579e-02
```

```
## 7023   0.1526674  0.0841288  0.4048314  9.355e-02
## 7129  -0.2438400 -0.7813955 -0.0778077 -1.231e-01
## 7223  -0.3703753 -0.0062032  0.5345634 -8.262e-03
## 7323  -0.2332947 -0.6230070  0.1372089 -3.888e-01
## 7423   0.1297019  0.1550557 -0.1472036  5.770e-02
## 7523  -0.0798916 -0.1873270  0.2374266  2.435e-01
## 7623  -0.2726002  0.1246970  0.0713333  5.638e-02
## 7723  -0.1211563 -0.1365624  0.2374754  3.243e-02
## 7823   0.0613332 -0.2527733  0.2235868  1.054e-01
## 7923  -0.2458638 -0.0610742  0.0605757  1.108e-01
## 8023  -0.3046492 -0.0324591  0.1643438 -5.957e-02
## 8129   0.0444498 -0.0166096  0.5045293 -2.249e-02
## 8222   0.3979411  0.5157519  0.1340822 -2.920e-01
## 8323  -0.1615627 -0.1803350  0.2885832  2.732e-01
## 8423  -0.2835621  0.3843158 -0.2329181 -2.570e-01
## 8522   0.6491125 -0.0587328  0.2412793 -2.749e-01
## 8623  -0.1507930  0.0379517 -0.0144627 -2.957e-01
## 8722   0.1961413 -0.2455479 -0.0381623  4.445e-01
## 8823  -0.2895133 -0.0052846  0.1653261  1.873e-02
## 8923   0.0376807  0.1443428  0.0097291  4.941e-01
## 9023  -0.1964282  0.3965705 -0.3086188 -1.035e-01
## 9128  -0.3668176 -0.1493358 -0.0509618 -3.919e-01
## 9222  -0.0819419 -0.1061961  0.1050838  1.147e-02
## 9322  -0.2910824 -0.3012458 -0.1477966  6.761e-02
## 9420   0.0998779  0.1139785 -0.1739891  7.199e-02
## 9520  -0.0645343 -0.1563086 -0.3314003 -6.765e-03
## 9620  -0.1160040  0.2353798 -0.1229283 -2.031e-01
## 9722   0.1182470  0.4691932  0.1648001  1.334e-01
## 9822   0.0611955  0.0328720 -0.0062472 -1.131e-02
## 9922  -0.2695558 -0.3471605 -0.1425196 -2.266e-01
## 10022  0.1985055 -0.0366366  0.2577905  7.077e-02
## 10128 -0.1854305  0.1236048 -0.0569911  3.843e-01
## 10222 -0.1133914 -0.0075490 -0.2469025  4.332e-01
## 10322 -0.2423864 -0.0769265 -0.0068136  3.303e-01
## 10422 -0.2694828 -0.1950013 -0.5326334  8.340e-02
## 10522  0.1384899  0.0978424  0.0989479  3.634e-01
## 10622 -0.3455992  0.0211063  0.0014173  9.689e-02
## 10722 -0.1888588 -0.1918898  0.2819052  3.259e-01
## 10822 -0.1567642  0.0443601  0.0942504  1.964e-01
## 10920  0.1367451  0.2713506 -0.0631185  1.952e-01
## 11020 -0.1989917  0.2340113  0.1005444  2.229e-01
## 11125 -0.2836329  0.2888499 -0.0121579  1.153e-02
## 11220 -0.2138584  0.5579553 -0.2113633  2.500e-01
## 11319 -0.4416222 -0.1912018  0.2819913 -1.725e-01
## 11420  0.1300320  0.1450881  0.1754977  2.607e-01
## 11520  0.0701930  0.2618631  0.1622252  2.599e-01
## 11620 -0.2646073  0.0971431  0.0234155  1.224e-01
## 11720  0.1455881 -0.1473828  0.2094969  4.184e-01
## 11820  0.0425656  0.1618848  0.4142068  1.558e-01
## 11920 -0.0022415  0.0028141  0.3604585  3.493e-01
## 12020 -0.0792630  0.1442370  0.1756964  7.471e-02
## 12121 -0.2962662  0.2590603  0.2403905 -1.865e-02
```

```
## 12220  0.4873889  0.0964471  0.3196559  9.474e-02
## 12320  0.4254501 -0.1508024  0.1071930  8.383e-02
## 12419  0.0915167  0.2266679 -0.0450604  3.477e-02
## 12519  0.0008473  0.3310828  0.0561715  3.123e-01
## 12619  0.2761916  0.1967260 -0.1914867  4.057e-02
## 12719  0.0290240  0.2259687  0.1766327  1.450e-01
## 12819 -0.0326160 -0.1082948  0.1302640  3.967e-01
## 12917  0.1454341 -0.1309961  0.1387259  3.185e-01
## 13014 -0.3898341 -0.5518540 -0.1043521 -1.003e+00
## 13116 -0.0874457  0.0352279  0.1110728  6.491e-01
## 13214  0.2747454 -0.2686594 -0.1728071  1.650e-01
## 13312 -0.2074552  0.1263470  0.2287254  1.110e-01
## 13411 -0.1994243  0.0459706  0.0893016  3.445e-01
## 13511 -0.0464650  0.0831189  0.3041005 -1.098e-01
## 13610 -0.3574069  0.2370188  0.0102276 -1.218e-01
## 13710 -0.0779452  0.2298673  0.0789350 -3.552e-02
## 13810 -0.4561558  0.0796678  0.1551220 -1.600e-02
## 13910 -0.0894210 -0.2567719  0.0652943  1.640e-01
## 14010 -0.4085640 -0.1198440  0.4573837 -7.802e-02
## 14116 -0.2442445  0.1848813  0.2611788  3.364e-01
## 14213 -0.0835079  0.1584748  0.1789273  1.374e-01
## 14311 -0.1354962  0.1364674  0.1662084  2.377e-01
## 14410  0.3675657  0.2272349 -0.0033997  1.726e-02
## 14510 -0.3082028 -0.2247086  0.2587408  5.200e-02
## 14610  0.0579336  0.0396028 -0.0676779  3.039e-01
## 14710 -0.0414785 -0.0351164  0.2688450  1.363e-01
## 14810 -0.0811295  0.0929097  0.4110895  1.967e-01
## 14910 -0.0837463 -0.0671813  0.2026799  4.029e-01
## 15010 -0.1176830  0.0129151 -0.1601890  1.505e-01
## 15116  0.0189192 -0.3343325 -0.0675097  1.022e-01
## 15213  0.3056269 -0.0200145 -0.2158626  6.350e-03
## 15311  0.6833349  0.4702748  0.2080142 -6.914e-01
## 15410 -0.2510789  0.1701038  0.2578838  3.023e-01
## 1559  -0.3982615  0.0141365 -0.1989443 -9.418e-02
## 15610  0.3284256 -0.0780968  0.3148607 -2.435e-01
## 15710 -0.0234464 -0.0635550  0.2089241  2.241e-01
## 15810 -0.3745707 -0.3102277  0.2604356 -1.638e-01
## 1599  -0.2959559 -0.1116600  0.4071579 -1.281e-01
## 16010 -0.2540406 -0.3395770  0.1230849 -1.785e-02
## 16116  0.1984717  0.1927428  0.0342992  1.596e-01
## 16213  0.0876120  0.1391221  0.2123515  1.860e-01
## 16310 -0.0995648  0.0859285 -0.0007160 -2.793e-01
## 16410 -0.0908099  0.2061845 -0.0549381  4.914e-01
## 16510  0.3439367  0.0302291  0.3256173  1.625e-01
## 16610 -0.2946180  0.3501959  0.0872411 -1.218e-01
## 16710 -0.3656910  0.1572183 -0.0755572 -8.073e-02
## 16810 -0.2034983  0.0166446  0.2656824  1.933e-01
## 16910  0.2233807 -0.1225638  0.2891615 -4.074e-02
## 17010 -0.3437468  0.1141551  0.2665691  2.640e-01
## 17116 -0.0227390  0.0718352  0.0117870  3.198e-01
## 17213  0.1109895 -0.1605710  0.0293771  2.100e-01
## 17311  0.5602653  0.0847163  0.2994744 -7.107e-02
```

```
## 17410 -0.0486846 -0.4754710 -0.0518828  1.305e-01
## 17510 -0.4587410 -0.0128061  0.2987179 -1.435e-01
## 17610 -0.3105246  0.1821964  0.1076534  2.629e-01
## 17710  0.0405872  0.0306567  0.2094628  4.764e-01
## 17810  0.0429200 -0.2007502  0.0976714 -9.144e-02
## 17910 -0.4895070  0.0978410  0.4096915 -4.744e-02
## 1809  -0.2197105  0.2063950  0.3562036 -5.875e-02
## 18116  0.0604231  0.1971218  0.1263765  1.505e-01
## 18213  0.7822450  0.1442800  0.5868449 -4.987e-01
## 18311  0.1501269 -0.4002469 -0.7075978 -3.698e-02
## 18410  0.1697005 -0.3131264 -0.1985063  3.678e-01
## 18510  0.0538298  0.1590482  0.1073695  7.923e-02
## 18610  0.2584663 -0.4425188 -0.1309691  2.757e-01
## 1879   0.8556916  0.2470054  0.5605869 -4.774e-01
## 1888  -0.0432348  0.3463206  0.0943887  3.334e-01
## 1898  -0.1528427  0.2033218  0.0220443  3.056e-01
## 1908  -0.3860652 -0.1220834 -0.0659720 -1.461e-01
## 19115 -0.0288694  0.2325101  0.3712990  2.260e-01
## 19212 -0.0721898  0.2208979  0.0354161  1.023e-01
## 1939   0.2980011  0.1574224  0.2836581  1.089e-02
## 1948   0.5760435  0.2155334  0.1567522 -5.706e-01
## 1958   0.0390443  0.0284796  0.1062255  2.886e-01
## 1968  -0.0696477  0.2841943 -0.6047965  3.557e-01
## 1978  -0.2150904 -0.0653718 -0.0001356  2.777e-01
## 1988  -0.4919558 -0.3730378  0.3297822 -4.369e-01
## 1998  -0.2932670 -0.2658987  0.5711168 -8.663e-02
## 2008  -0.1714859  0.0320065  0.4576201 -4.045e-02
## 20115 -0.1003698 -0.0727738  0.3239166  4.386e-01
## 20212  0.2723503  0.0509715 -0.3210874 -3.710e-02
## 2039  -0.1962653  0.0759822  0.3120139  2.380e-01
## 2048   0.0721819 -0.2956380 -0.2894310  4.816e-01
## 2058  -0.1555740  0.0787998  0.3207413  9.882e-02
## 2068  -0.1018857  0.0117644  0.4004452 -7.047e-02
## 2078  -0.0985797 -0.0826581  0.6695857  1.712e-01
## 2088  -0.0844918  0.1855673 -0.0235546  2.386e-01
## 2098   0.2490261  0.4143857 -0.2166361  2.471e-02
## 21014 -0.2707723 -0.5430594  0.0186998 -4.377e-01
## 21115  0.4460202  0.3652148  0.1843507 -4.086e-01
## 21213 -0.3588144  0.0082276  0.2393964 -5.868e-02
## 21311 -0.2791404  0.0099118 -0.0446491  6.735e-02
## 21410  0.2905651 -0.0845543  0.0733102 -1.367e-01
## 2158  -0.1945577  0.1193582 -0.2910636  2.359e-01
## 2168  -0.0471089  0.0970858  0.0739329  2.250e-01
## 2178  -0.2244250  0.2229476  0.2011948 -2.083e-01
## 2188  -0.2237895 -0.2890216  0.1294390  1.017e-01
## 2198  -0.3455992  0.0211063  0.0014173  9.689e-02
## 2208   0.2223845 -0.0935456 -0.0339463 -1.527e-01
## 22115 -0.2599126  0.0670307  0.3673098  1.259e-01
## 22212  0.2214902 -0.0007283  0.1924310 -9.381e-02
## 2239  -0.5527446  0.1802766  0.3423679 -1.250e-01
## 2248  -0.0595980  0.0051982 -0.1588129 -5.245e-02
## 2258  -0.2770286 -0.2905388  0.0503941 -4.786e-02
```

```
## 2268   0.4630467  0.2352317  0.1783506 -2.631e-01
## 2278  -0.0087946  0.1145822  0.1973306  4.084e-01
## 2288   0.0554407  0.2496381  0.3584665  1.279e-01
## 2298  -0.3388942  0.2399566 -0.0672323  1.874e-01
## 2308  -0.2132582  0.0771280  0.0337945 -1.586e-01
## 23115 -0.1962302 -0.3151050  0.1372282 -1.294e-01
## 23212 -0.4039433 -0.0290941  0.2343488 -8.205e-02
## 2339  -0.1768456 -0.0202879  0.2212933  1.487e-01
## 2348  -0.1174084 -0.0192737 -0.1729562  5.914e-02
## 2358   0.6213048  0.0990737  0.1092882 -3.735e-01
## 2368  -0.0837858 -0.0285005 -0.0417168  2.686e-01
## 2378  -0.3028156  0.0607948  0.0123554  1.112e-01
## 2388  -0.5407475 -0.3096353 -0.0410472 -6.891e-01
## 2398  -0.2646073  0.0971431  0.0234155  1.224e-01
## 2408   0.0326716  0.2739125 -0.2604332  1.770e-01
## 24114  0.5552925 -0.0935145  0.0497040 -2.488e-01
## 24211 -0.2267318 -0.1619887 -0.0176708 -5.496e-02
## 2438  -0.2616674  0.0334369  0.0231556 -1.770e-01
## 2447  -0.5174936 -0.0322362  0.1284530 -2.398e-01
## 2457   0.4542766  0.1067544  0.2419394  8.968e-02
## 2467  -0.1796916  0.2280367  0.1020720  1.350e-01
## 2477  -0.1796916  0.2280367  0.1020720  1.350e-01
## 2487  -0.0243008 -0.2554836  0.2363398 -2.189e-01
## 2497   0.1708117 -0.2555332 -0.4081439  1.613e-01
## 2507  -0.2691186  0.0159881  0.2201018 -1.857e-01
## 25114  0.3845035  0.4539931  0.3024619 -3.594e-01
## 25211 -0.2526786  0.0678462 -0.0312029  1.995e-01
## 2536  -0.3306898  0.1370951 -0.1200978 -7.072e-02
## 2545  -0.4792284 -0.0676265  0.0369557 -9.856e-02
## 2555   0.1830823  0.2318946  0.1477203 -1.262e-01
## 2565   0.3078647  0.1837134  0.1962097 -1.487e-01
## 2575  -0.0270076  0.1429608  0.0963218  2.794e-01
## 2585  -0.1176830  0.0129151 -0.1601890  1.505e-01
## 2595   0.0431937  0.1365896  0.2100495  3.081e-01
## 2605  -0.0754671 -0.0650485 -0.2832226  2.266e-01
## 26112  0.0661842  0.0684677 -0.2029694  8.651e-02
## 26210 -0.3183032  0.0326611  0.0080953  4.420e-02
## 2635  -0.1305890  0.2589601  0.2670902  3.343e-01
## 2645  -0.2236141  0.1513053  0.0394272  1.854e-01
## 2655  -0.0385683 -0.1788363 -0.2020051  1.711e-01
## 2665  -0.1181587  0.3627796 -0.1142527  3.488e-01
## 2675  -0.2005555  0.4834639 -0.2046020 -1.592e-01
## 2685  -0.0384989  0.0790561  0.3456930  3.077e-01
## 2695  -0.4198811 -0.1298023 -0.2785953 -3.380e-01
## 2705  -0.3183032  0.0326611  0.0080953  4.420e-02
## 27112  0.2105925 -0.5292327 -0.5163980  4.197e-02
## 27210 -0.3016037  0.0165313  0.0133852 -9.993e-02
## 2735  -0.3335410 -0.2203218  0.0542631 -3.484e-01
## 2745  -0.2724793  0.0774060 -0.2431008  4.479e-02
## 2755   0.1962104  0.5177002 -0.0870639  6.504e-02
## 2765  -0.0677303  0.3859928 -0.4614034  1.752e-01
## 2775   0.0954911  0.1688148  0.0238724  3.825e-01
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## 2785  -0.1723844 -0.1845392  0.2237287  1.607e-02
## 2795  -0.1963912  0.4212164 -0.2115918 -4.252e-01
## 2805   0.0275359  0.0174529 -0.2345136  1.010e-01
## 28112  0.0337189  0.0636917 -0.2779383  4.907e-01
## 28210  0.2071115  0.0934696 -0.1905805 -2.456e-01
## 2835  -0.2164806  0.2860605 -0.1186874  2.896e-01
## 2844   0.1208897  0.1005922 -0.2566120  3.224e-01
## 2855   0.0005289  0.3037009 -0.2363739  2.952e-01
## 2865  -0.4427579 -0.1119520 -0.1757352 -6.534e-01
## 2875   0.0618482 -0.1415298  0.3934792  2.940e-01
## 2885   0.0486157  0.3181848 -0.1807189 -2.124e-02
## 2895   0.1135257  0.2840026 -0.2579722 -1.225e-02
## 2905   0.0872684  0.0331459 -0.5354105  1.523e-01
## 29112 -0.2359940  0.2137462  0.1258873  1.190e-01
## 29210 -0.1456052  0.2994976 -0.1077076  1.052e-01
## 2935   0.3456839  0.4167805 -0.0043066  1.896e-02
## 2945  -0.1143339 -0.4097315  0.0418453 -3.639e-01
## 2955   0.2332906  0.2882429 -0.3271451 -1.544e-02
## 2965  -0.3292278  0.3766994  0.1051153  1.592e-02
## 2975  -0.1037242  0.2743393  0.1238516  3.895e-02
## 2985   0.3473659 -0.9010746  0.2704460  5.619e-01
## 2995  -0.4165200 -0.2505045  0.2568108 -4.016e-01
## 3004   0.1624503  0.5129521 -0.0577336  5.580e-03
## 30112  0.1834036 -0.4712329 -0.6023729  6.467e-03
## 30210  0.3650183 -0.1602142  0.2858128 -5.919e-01
## 3034   0.0526066  0.1477673 -0.4284718  2.956e-01
## 3044  -0.2251774 -0.0318647 -0.3469471 -1.228e-01
## 3054   0.3964331  0.4342047 -0.2185837 -2.850e-01
## 3064   0.0648297  0.0596833 -0.3989552 -2.750e-01
## 3074   0.0820423  0.1226693 -0.4547982  2.166e-01
## 3083   0.2398802  0.0144618  0.1415768  1.527e-01
## 3094  -0.0486846 -0.4754710 -0.0518828  1.305e-01
## 31011 -0.2263986  0.4577103 -0.2137522 -1.647e-01
## 31111 -0.1354072  0.3465111 -0.0514462  4.061e-02
## 31211  0.1447168  0.2428811  0.0150996 -3.081e-01
## 3138  -0.0672018 -0.1639667  0.1006813 -2.749e-01
## 3144   0.0753460  0.5607101  0.0291417  7.744e-02
## 3154  -0.0496081  0.2966495 -0.1928156  2.069e-01
## 3164  -0.0402153  0.0152164 -0.4246545 -7.221e-02
## 3174   0.1282891  0.1076966  0.1522766  1.980e-01
## 3184   0.0949785  0.1232783 -0.0280396 -5.257e-01
## 3194  -0.0169709 -0.0966348  0.3280325  7.904e-02
## 3204   0.3887876  0.2330818  0.2946394  5.685e-02
## 32111  0.1737207  0.2756383  0.0308751 -3.090e-01
## 32210 -0.2144774  0.3803476  0.0445919 -1.482e-02
## 3234   0.6959961  0.3187550  0.1759133 -5.158e-01
## 3244   0.0946341 -0.0930303 -0.6490272  6.179e-02
## 3254  -0.1069000  0.1144689 -0.0549666  1.152e-01
## 3264  -0.1428164  0.5125072 -0.2248716 -9.545e-02
## 3284  -0.3547428  0.1686650 -0.1237989  1.576e-01
## 3294   0.0739180 -0.6967663 -0.4246726  4.446e-01
## 3304  -0.2325431  0.0943115 -0.2333304 -3.230e-02
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## 33111 -0.0137296 -0.2814874 -0.2478170 -1.638e-01
## 33210 -0.1315524 -0.3032239 -0.0294444 -1.524e-01
## 3334  -0.4697931  0.0233553  0.3178733 -3.267e-02
## 3344   0.3503873 -0.1795165 -0.3642108 -1.854e-01
## 3353  -0.2316527 -0.0308183  0.0669498  1.817e-01
## 3364   0.4480666 -0.0088733 -0.2248949 -2.976e-01
## 3374  -0.3055540 -0.1730744  0.0508088 -1.938e-01
## 3384   0.4480666 -0.0088733 -0.2248949 -2.976e-01
## 3394  -0.3289936  0.2163742 -0.1115166  2.500e-01
## 3404   0.2962023  0.3710381  0.2255137 -1.502e-01
## 34111  0.1140350  0.0790020  0.4727919  3.654e-01
## 34210 -0.2080355  0.0847699  0.3108540  3.162e-01
## 3434   0.0985469  0.0468556  0.1717029 -8.574e-02
## 3444  -0.6505531 -0.4153053 -0.1849085 -1.428e+00
## 3454   0.2833557 -0.5555769  0.1608860  5.162e-01
## 3464  -0.0547823  0.0796652  0.0162313  4.249e-01
## 3474   0.0478275 -0.0716038  0.0567101  2.662e-02
## 3484  -0.1489997 -0.1943676 -0.1060638 -2.339e-02
## 3494  -0.0274863  0.0912200  0.0229093  3.722e-01
## 3504   0.7866216  0.5291781  0.3796103 -7.143e-01
## 35111 -0.3713799  0.3963378 -0.2492218  1.152e-01
## 35210  0.4002430  0.1209370  0.4348255  3.738e-01
## 3534  -0.3168094 -0.0168394  0.1586481  7.142e-02
## 3544   0.1619122 -0.4627639  0.5861206  3.627e-01
## 3554  -0.1227538  0.0508920 -0.0003979  5.561e-01
## 3564   0.0416503 -0.0269902 -0.1118878  2.416e-01
## 3574  -0.2240882 -0.5784204  0.5157260 -3.679e-01
## 3584   0.0571648 -0.5308488  0.2693757  4.832e-01
## 3594   0.0595485  0.2269247 -0.2288966 -2.546e-01
## 3604  -0.1449056  0.3217816 -0.4422510  8.921e-03
## 36111 -0.0532534  0.0589180  0.0043217  3.788e-01
## 3629  -0.2111123  0.1286709 -0.5199130 -3.457e-01
## 3634   0.2376701  0.1192441  0.2191120  2.924e-01
## 3644  -0.1718765 -0.1765173 -0.0032037 -3.388e-01
## 3654  -0.3525558  0.0885115 -0.1877729  7.024e-02
## 3664   0.3153747  0.2925978 -0.3341940 -1.918e-01
## 3674   0.0806131  0.5118482 -0.3784209 -3.094e-02
## 3684   0.1325694 -0.1344847 -0.3091088 -5.539e-01
## 3694  -0.2820252  0.1024092  0.0689403 -9.032e-03
## 3704  -0.2075440  0.0522482 -0.3201705  9.431e-02
## 37111  0.4199068  0.0189105  0.4989097 -3.776e-02
## 3729  -0.2996862  0.1183297  0.1567783 -2.805e-01
## 3734   0.3258956 -0.7751984 -0.1517950  1.925e-01
## 3744  -0.5041294  0.1505278  0.2583668 -2.012e-02
## 3754   0.1016076  0.3260361  0.2009387  2.938e-01
## 3764  -0.1433220  0.0500812 -0.0796612  3.143e-02
## 3774   0.3279351 -0.3821242 -0.0046146  2.344e-01
## 3784   0.2478062 -0.2296037 -0.5682819 -1.492e-01
## 3794  -0.3999590 -0.1163129  0.3227682 -1.272e-01
## 3804  -0.0472801 -0.2208176 -0.0018549 -1.318e-01
## 38111  0.3958550 -0.4107764  0.2940348 -3.267e-01
## 38210 -0.1092189 -0.4680670 -0.2143178 -1.427e-01
```

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## 3834  -0.0072863  0.3000359  0.0380349  2.736e-01
## 3844  -0.1132727  0.3599018 -0.4216253  3.632e-03
## 3854   0.0631513 -0.2052863 -0.0977962  6.275e-02
## 3864   0.3311375 -0.3429839  0.1712715  3.796e-01
## 3874  -0.2028843  0.1422178  0.0411575  7.841e-02
## 3884   0.7277959  0.6089260  0.1163078 -7.007e-01
## 3894   0.1512771  0.0586585  0.2249674  2.280e-01
## 3904   0.1087387 -0.0927304 -0.1131694  5.217e-01
## 39111 -0.2201091 -0.0987430 -0.2101523  1.463e-01
## 3929  -0.0480681  0.1610284 -0.3353467  2.188e-01
## 3934   0.3723937  0.4305260  0.1141812 -5.231e-01
## 3944   0.4043500 -0.9425581  0.0962878  2.949e-01
## 3954   0.2352144 -0.0139041 -0.3740529  5.572e-03
## 3964   0.2646981  0.0576197  0.0622302 -7.231e-03
## 3974   0.0867061 -0.2900974  0.3808868  3.619e-01
## 3984  -0.1696845 -0.3390812 -0.4055177 -2.216e-01
## 3994  -0.0595980  0.0051982 -0.1588129 -5.245e-02
## 4004  -0.0405335 -0.0227263 -0.1662192 -2.004e-01
## 40111  0.0645058 -0.1965019  0.0981897  4.243e-01
## 40210  0.0958293  0.0088355  0.2466130  5.630e-02
## 4034   0.1375351 -0.1845472 -0.5133688  1.178e-01
## 4044  -0.1605841  0.1044319 -0.2958474  9.444e-02
## 4054   0.4171997  0.3292972  0.2872537 -1.920e-01
## 4064   0.4234134 -0.9832242  0.1565685  3.198e-01
## 4074   0.1072259 -0.3087300 -0.8432562 -9.299e-02
## 4084  -0.1641278 -0.2162884  0.0062211 -5.852e-01
## 4094  -0.2325431  0.0943115 -0.2333304 -3.230e-02
## 41011 -0.3539274 -0.7081619  0.5497017 -4.452e-01
## 41111 -0.1049641  0.3639996 -0.0783938  1.571e-01
## 41211  0.3749295 -0.6018247  0.5816195  1.299e-01
## 4139   0.2105925 -0.5292327 -0.5163980  4.197e-02
## 4143  -0.1133495  0.1244270 -0.2842915  3.263e-03
## 4154   0.4858009  0.0915154  0.0760967 -5.278e-01
## 4163   0.3986627 -0.5514123 -0.0912546  4.775e-02
## 4174  -0.0372054  0.2127908 -0.2394952 -3.315e-03
## 4184   0.3551241 -0.4401240  0.0813604  2.699e-01
## 4194   0.3133038 -0.5594987  0.0424340  3.473e-01
## 4204   0.2034312 -0.0968089  0.1490109 -2.901e-01
## 42111  0.0818038 -0.1623871  0.4452064 -8.894e-02
## 42210  0.1980007 -0.3135330 -0.3221689  1.968e-01
## 4234   0.2879462  0.6223441  0.0388502 -2.736e-01
## 4244  -0.3970395 -0.3650900 -0.0317636 -4.511e-01
## 4254  -0.0724637  0.2105817  0.3866031  1.778e-01
## 4264  -0.1223744 -0.1387612  0.5945029 -8.243e-02
## 4274   0.0498737  0.0664716 -0.5006789  2.535e-01
## 4284  -0.3396572 -0.6588919  0.0543136 -9.377e-01
## 4294  -0.3500860  0.0541466  0.0534232  2.798e-02
## 4304   0.5990314  0.1664953  0.2294430 -5.406e-01
## 43111  0.0756564 -1.0038593  0.4085728 -2.870e-01
## 43210 -0.6109245  0.1613132  0.1397418 -3.456e-01
## 4334   0.1483909  0.0008814 -0.5723561  2.692e-05
## 4344   0.5711279  0.2061116 -0.0493776 -4.390e-01
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## 4354   0.2621266  0.0361904 -0.0185207  2.634e-01
## 4364   0.2054331 -0.1715000  0.1105786  9.211e-02
## 4374   0.1897033  0.1214997 -0.0170889  8.721e-02
## 4384   0.7788826 -0.0666454  0.5313253 -2.756e-01
## 4394   0.8291214  0.2557382  0.4980186 -4.817e-01
## 4404   0.1267685  0.3069327 -0.1864923 -2.641e-01
## 44111  0.3377955  0.0361832 -0.1699818 -3.061e-02
## 44210  0.0452857  0.3903285 -0.1359353  1.185e-01
## 4434   0.4215284 -0.5358067  0.4570989  4.976e-01
## 4444   0.6794530  0.5244722  0.0473583 -6.452e-01
## 4454   0.4346263 -0.6281303  0.0224670  9.470e-02
## 4464  -0.3297889  0.2051361  0.1729002  1.293e-01
## 4474  -0.1232253  0.0967379  0.1138392  2.559e-01
## 4484  -0.4096313 -0.1493904  0.1624654 -2.964e-01
## 4494  -0.0372054  0.2127908 -0.2394952 -3.315e-03
## 4504  -0.0628108 -0.0009098  0.0371195 -1.631e-02
## 45111 -0.0564503 -0.0556265  0.2093579  3.503e-01
## 45210  0.2611253  0.0412862 -0.1552113  1.396e-01
## 4534  -0.1102572 -0.6853238  0.8605988 -3.340e-01
## 4544  -0.4289662 -0.0305665 -0.2016304 -2.021e-01
## 4554  -0.0564503 -0.0556265  0.2093579  3.503e-01
## 4564   0.5238510 -0.3212425  0.6383113 -4.529e-01
## 4574   0.0433459 -0.0435856 -0.5980553  2.028e-01
## 4584   0.2294493  0.1424883 -0.4567458 -9.311e-02
## 4594  -0.3682156  0.1794034  0.2342566 -1.570e-01
## 4604   0.3452720  0.0149795  0.1745367  2.732e-01
## 46111  0.6529509  0.1752112  0.4570418 -6.191e-01
## 4629  -0.2418228  0.2532747 -0.0901903  8.177e-02
## 4634  -0.0536964 -0.2007572 -0.0897202 -3.906e-01
## 4644   0.2352595 -0.1234749  0.2956260  3.338e-01
## 4654  -0.2310494  0.3392870  0.0036540  2.616e-02
## 4664   0.5007959  0.1846839  0.4313823 -3.809e-02
## 4674   0.0322798 -0.6527124  0.4886137  6.154e-02
## 4684  -0.1033222  0.5851439 -0.2218813  1.149e-01
## 4694  -0.1519190 -0.5183932 -0.3110494 -5.842e-01
## 4704   0.3328936  0.1567391 -0.2347369 -1.067e-01
## 47111 -0.1183681  0.0264684 -0.4188810  1.706e-01
## 4729   0.1912919 -0.0906355 -0.4366977  5.604e-02
## 4734  -0.1098647  0.2228913 -0.1808546 -1.792e-02
## 4744  -0.2104108  0.0999110  0.0349622 -6.714e-02
## 4753   0.1132577 -0.4835672 -0.0347263 -4.333e-01
## 4764   0.2956800 -0.1428898 -0.1828530  8.452e-02
## 4774   0.1024226  0.1769085 -0.0129988  5.656e-01
## 4784   0.2534935 -0.6207495 -0.3807395  9.798e-02
## 4794   0.0862469 -0.1351024 -0.4623969  2.588e-01
## 4804  -0.4730606  0.5420350 -0.0153750  1.853e-02
## 48111  0.1195235 -0.2060884 -0.3571721  3.023e-01
## 4829  -0.0704485  0.0329101 -0.1486330  5.928e-02
## 4834  -0.0817875 -0.1252621 -0.0792282 -1.308e-02
## 4844  -0.1494678  0.1669408  0.3656041  2.854e-01
## 4854   0.0880015 -0.1115329 -0.0433137  1.800e-01
## 4864  -0.1921059  0.0084149  0.0806999  1.903e-01
```

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## 4874   0.1753575  0.3357122  0.0210495  6.246e-03
## 4884   0.4269233  0.2254328  0.1284561  1.580e-02
## 4894  -0.3920910  0.0792136  0.1341715 -1.021e-01
## 4904   0.3240727 -0.5790179  0.5940710  3.200e-01
## 49111 -0.0116975 -0.2747788  0.1424052  7.843e-02
## 4929  -0.0744691 -0.1628178 -0.0878299 -1.673e-01
## 4934  -0.2391316  0.0611575 -0.2401350 -1.357e-01
## 4944  -0.1962302 -0.3151050  0.1372282 -1.294e-01
## 4954   0.2043432 -0.0774317  0.0072786  4.314e-01
## 4964  -0.3830504  0.0834215 -0.4535207 -3.734e-01
## 4974   0.2478062 -0.2296037 -0.5682819 -1.492e-01
## 4984   0.0373284  0.1593942 -0.0832111  4.741e-02
## 4994  -0.0561044  0.3539499 -0.0794514 -2.000e-02
## 5004  -0.0640971  0.2068400  0.0312211  3.412e-02
## 50111 -0.2418228  0.2532747 -0.0901903  8.177e-02
## 5029  -0.1282433  0.4041058 -0.0297060  1.877e-01
## 5034  -0.3306661 -0.2180890  0.3167752 -1.153e-01
## 5044  -0.5599590 -0.2959164  0.4508604 -4.366e-01
## 5054   0.0486037  0.2485717  0.1879818  1.435e-01
## 5064   0.3596801  0.4557343 -0.1485077 -3.981e-01
## 5074  -0.1811563 -0.0175541  0.1399364 -2.248e-01
## 5084   0.4056935  0.0492304  0.4539656 -5.631e-02
## 5094  -0.0949258  0.1386819  0.4752493  1.576e-01
## 51011 -0.0853423  0.3125889  0.1059524  2.437e-01
## 51111  0.2867702 -0.6917355 -0.2755147  1.414e-01
## 51211 -0.0660499  0.2079858 -0.3019053  3.344e-01
## 5137   0.1308222 -0.5210361  0.0208151 -4.104e-01
## 5144   0.2909071  0.3892274  0.0149231 -4.156e-02
## 5154   0.2478062 -0.2296037 -0.5682819 -1.492e-01
## 5164   0.0084807  0.2395356 -0.2836714  1.905e-01
## 5174   0.3346439 -0.6050217  0.1099142  3.752e-01
## 5184   0.3725792 -0.6464760  0.4498326 -2.405e-01
## 5194  -0.0168569 -0.6919633 -0.9457599  1.549e-01
## 5204   0.3795582 -0.0237767  0.1353716  1.755e-01
## 52111 -0.2592785 -0.8303565  0.3084811 -8.328e-01
## 5229  -0.1566332 -0.3258774  0.0384587  1.537e-01
## 5234   0.2352144 -0.0139041 -0.3740529  5.572e-03
## 5244   0.0661842  0.0684677 -0.2029694  8.651e-02
## 5254   0.2236635  0.3955201 -0.0070280  2.724e-01
## 5264  -0.1074353 -0.0647917 -0.4670587 -6.278e-02
## 5274  -0.0371719 -0.0380759 -0.0434082  1.027e-01
## 5284   0.3153747  0.2925978 -0.3341940 -1.918e-01
## 5294   0.6490347 -0.2934863  0.3461286 -1.264e-01
## 5304  -0.3469339  0.3201246  0.0432249  8.273e-02
## 53111  0.0271464  0.2681078  0.0211517  1.071e-01
## 5329   0.0482092 -0.0342380 -0.0353541 -1.529e-01
## 5334   0.4856431  0.1141605  0.2935038 -1.945e-01
## 5344   0.2761916  0.1967260 -0.1914867  4.057e-02
## 5354  -0.0316106 -0.2323000  0.0794376  5.243e-02
## 5364   0.4949503  0.3686145 -0.2902609 -5.385e-01
## 5373   0.4090249  0.2185051 -0.4128127 -4.398e-01
## 5384   0.4519259  0.1269882 -0.2771543 -3.837e-01
```
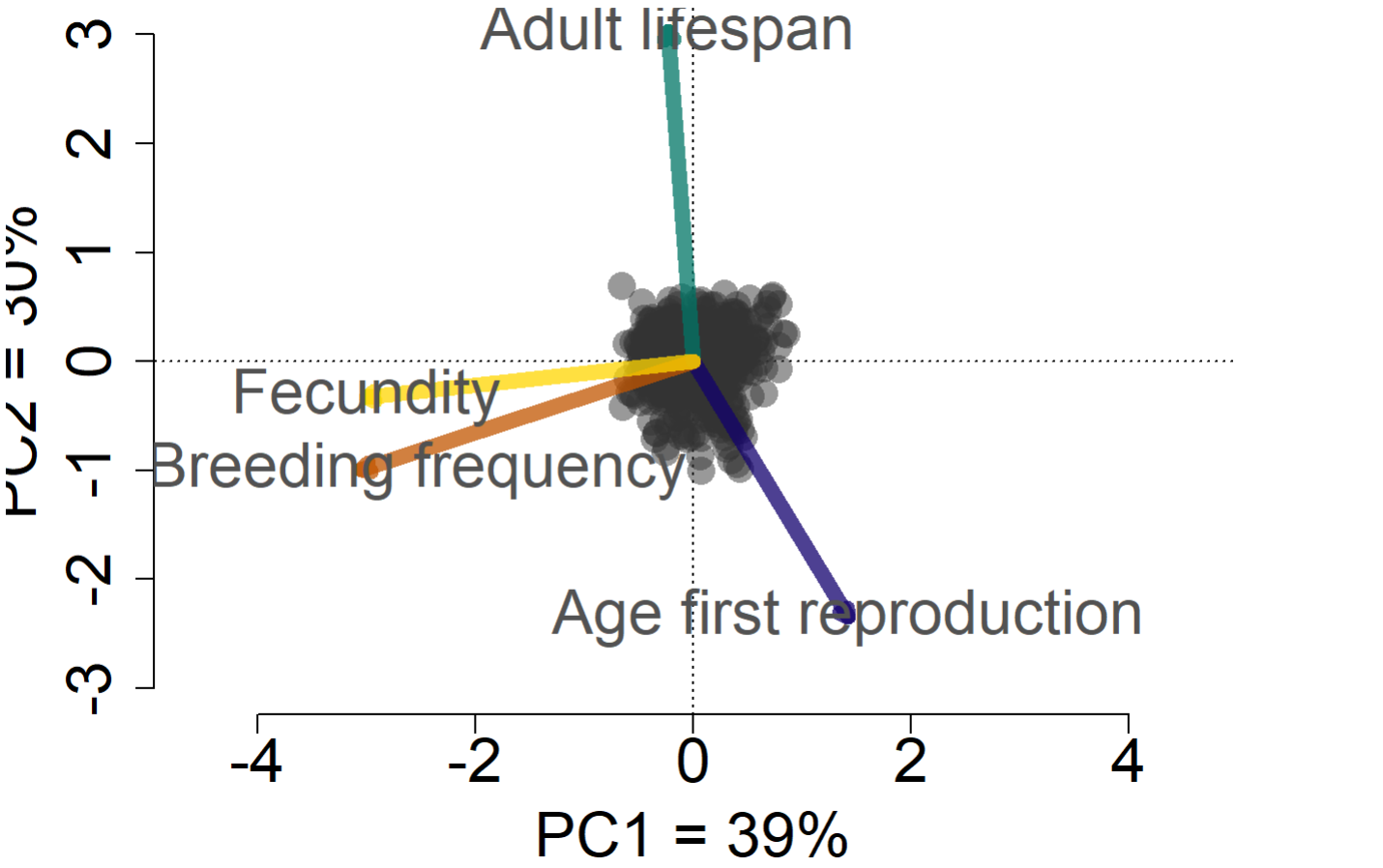

```
## 5394   0.0232831  0.1599846 -0.3386278  3.050e-02
## 5404   0.0524978  0.0897451  0.4671253  1.184e-01
## 54111 -0.2043644  0.3368129  0.0084628 -8.085e-02
## 5429  -0.2898585 -0.3701804  0.3905006 -2.061e-01
## 5434   0.3606851  0.1121723  0.2048370 -1.773e-02
## 5444   0.1634460 -0.1293570 -0.2945272  2.518e-01
## 5453   0.0431677 -0.3340505 -0.2563597 -5.248e-01
## 5464   0.2335805 -0.5782708 -0.4437072  7.198e-02
## 5474   0.5076183 -0.0884852  0.2357523 -4.344e-01
## 5484   0.2563221  0.1031255  0.2506666  2.523e-02
## 5494   0.2956800 -0.1428898 -0.1828530  8.452e-02
## 5504   0.1181853  0.0682882  0.0784427  3.760e-01
## 55111 -0.1920180 -0.1742381 -0.2206443 -2.313e-01
## 5529   0.1708117 -0.2555332 -0.4081439  1.613e-01
## 5534   0.3186679 -0.1919280 -0.1101622  1.145e-01
## 5544   0.4635801 -0.6898948  0.1140226  1.325e-01
## 5554   0.5661647  0.1928474  0.3022521 -6.546e-01
## 5564   0.2539964  0.1436592  0.2365303  2.811e-01
## 5574   0.1390923 -0.2679447 -0.1540953  4.612e-01
## 5584   0.0179973  0.0226973 -0.0774483  3.810e-01
## 5594   0.4005198  0.0128427  0.1652683  1.514e-01
## 5604   0.1388617  0.0734201  0.4378158 -6.507e-02
## 56111 -0.6044224 -0.1557565 -0.1182684 -6.630e-01
## 5629  -0.0911911 -0.1011445  0.0357947  3.708e-01
## 5634   0.1891618 -0.5635920 -0.2298153  3.553e-01
## 5644  -0.0539775  0.1984844 -0.0160893  1.797e-01
## 5654   0.1301694 -0.0583710 -0.3997521  2.084e-01
## 5664  -0.0963787 -0.2033082 -0.2161484  2.827e-01
## 5674   0.2723503  0.0509715 -0.3210874 -3.710e-02
## 5684  -0.3225848 -0.0455643 -0.2623209 -2.944e-01
## 5694  -0.2229358 -0.1962457  0.0653970  1.675e-01
## 5704  -0.3396572 -0.6588919  0.0543136 -9.377e-01
## 57111  0.4752556 -0.0668731 -0.1389199 -2.621e-01
## 5729  -0.3048626  0.1126474  0.3133516 -6.058e-02
## 5734  -0.0841687 -0.1149056 -0.1647583  4.243e-01
## 5744   0.1391958  0.1305979  0.4572975  1.092e-01
## 5754   0.2517575 -0.2196213 -0.2454979  1.350e-01
## 5764   0.0690731  0.0096882  0.1490319  5.718e-01
## 5774   0.0505595  0.0104133  0.0964328  2.175e-01
## 5784   0.3583519 -0.0403192  0.5217066  1.231e-01
## 5794   0.2956800 -0.1428898 -0.1828530  8.452e-02
## 5804  -0.4233815  0.1034909  0.2023299 -2.092e-01
## 58111  0.6010566  0.3875157 -0.0644553 -5.551e-01
## 5829  -0.0517551  0.1021738  0.1725734 -1.808e-01
## 5834  -0.3437034 -0.2923052 -0.0377120 -2.385e-01
## 5844  -0.0152793  0.0936833 -0.1826732  3.376e-01
## 5854   0.3351801  0.1308970  0.1660651 -3.319e-01
## 5864   0.2245685 -0.1616215 -0.3314728  9.949e-02
## 5874   0.0862469 -0.1351024 -0.4623969  2.588e-01
## 5884  -0.5172885 -0.1435018 -0.1939691 -5.095e-01
## 5894   0.0498737  0.0664716 -0.5006789  2.535e-01
## 5904   0.2136229 -0.2363949 -0.1358615  3.173e-01
```

```
## 59111  0.1717971  0.1842248  0.1621899  3.840e-01
## 5929   0.0911654  0.4732333 -0.1127631  2.678e-01
## 5934  -0.1489600 -0.2531115  0.4070397 -1.341e-01
## 5944   0.3708675 -0.0146188 -0.3927646 -2.906e-01
## 5954   0.3056269 -0.0200145 -0.2158626  6.350e-03
## 5964   0.2742097 -0.0170136 -0.6050941 -2.849e-01
## 5974   0.2327506 -0.0082838 -0.1956810  1.722e-01
## 5984  -0.4246281 -0.1738077 -0.0651051 -2.803e-01
## 5994   0.2679601  0.0508890  0.1236609 -3.225e-01
## 6004  -0.2073411 -0.0830605  0.2722818 -2.833e-01
## 60111 -0.0262575  0.0047056 -0.3226032  5.866e-01
## 6029  -0.1057883 -0.2588444 -0.2444093  1.806e-01
## 6034   0.4852025  0.0560022 -0.1719294 -3.403e-01
## 6044   0.0431677 -0.3340505 -0.2563597 -5.248e-01
## 6054  -0.2450051  0.0852667  0.0264987 -3.577e-04
## 6064   0.2810828 -0.3005897 -0.4630570 -1.058e-01
## 6074   0.3113022 -0.0657518  0.0034545  2.051e-01
## 6084  -0.1017421 -0.6254311 -0.1523837 -5.186e-01
## 6094  -0.0818290 -0.6679099 -0.0894160 -4.927e-01
## 61011  0.1501269 -0.4002469 -0.7075978 -3.698e-02
## 61111 -0.1679009  0.0641941 -0.6582586 -1.417e-01
## 61211 -0.1067906  0.1171792 -0.2077578 -3.912e-01
## 6137  -0.1519190 -0.5183932 -0.3110494 -5.842e-01
## 6144  -0.3457334 -0.1846576 -0.3834029 -3.261e-01
## 6154  -0.4266021  0.1783448  0.0943223 -5.758e-01
## 6164  -0.1332582  0.2998888 -0.4524736 -7.812e-02
## 6174   0.3567295 -0.3273136  0.1703151 -3.778e-01
## 6184   0.0682306 -0.3056204 -0.6122150  1.974e-01
## 6194  -0.1183681  0.0264684 -0.4188810  1.706e-01
## 6204  -0.1147459 -0.0163334 -0.4428883  7.166e-02
## 62111  0.2049052 -0.1380868 -0.7039403 -2.052e-01
## 6228  -0.0968785  0.2900013 -0.1517477  1.236e-01
## 6234  -0.3236825  0.2667367  0.0166110 -1.077e-01
## 6244  -0.1216981  0.0986121 -0.3740974  3.104e-01
## 6254  -0.3171258 -0.0151349  0.0130841 -2.008e-01
## 6264   0.3275406 -0.0802665  0.1673038 -6.409e-01
## 6274  -0.0718449 -0.1078503 -0.3072299  1.277e-01
## 6284  -0.0642644 -0.7053788 -0.0338746 -4.697e-01
## 6294   0.3005912 -0.8012945  0.1225387  5.008e-01
## 6304  -0.1067906  0.1171792 -0.2077578 -3.912e-01
## 63111  0.0946341 -0.0930303 -0.6490272  6.179e-02
## 6328  -0.5181274  0.1667540  0.1011323 -4.053e-01
## 6334   0.2245685 -0.1616215 -0.3314728  9.949e-02
## 6344   0.3279665  0.0768981 -0.5284230 -3.466e-01
## 6354  -0.2966657  0.3370384  0.0881538 -1.806e-01
## 6364  -0.4233815  0.1034909  0.2023299 -2.092e-01
## 6374   0.0983862 -0.1412759  0.1233116 -8.737e-02
## 6384  -0.2636608 -0.0038197  0.3376908 -5.620e-02
## 6394   0.3741619 -0.1013576  0.1581649  2.248e-01
## 6404   0.4147900  0.0621127 -0.3301198 -3.411e-01
## 64111 -0.0569072 -0.1135403  0.3182621  1.561e-01
## 6428   0.1994739  0.0627022 -0.3009059  1.287e-01
```

```
## 6434   0.0467603 -0.1797442 -1.0344560 -1.719e-01
## 6444  -0.4223105  0.1578807  0.0076088 -2.931e-01
## 6454  -0.3916909  0.3091036  0.0634923  6.562e-02
## 6464  -0.1968753 -0.2123303 -0.3637775  2.487e-01
## 6474   0.2790364  0.0734984 -0.0538114 -2.167e-01
## 6484  -0.1200271  0.1509080 -0.2728297  9.201e-02
## 6494  -0.1661410  0.2283284 -0.0793700 -2.914e-01
## 6504  -0.1364079 -0.4100672 -0.3002928 -1.782e-01
## 65111 -0.0044846  0.1088220  0.1315056 -9.753e-02
## 6527  -0.0048554  0.3066487  0.1104501 -2.727e-02
## 6534   0.2042325  0.1866055 -0.1289697 -8.618e-02
## 6543   0.1161707 -0.3697532  0.3969899  1.770e-01
## 6554  -0.4510564  0.2168680  0.0640956 -1.956e-01
## 6564  -0.1573753  0.0614566 -0.0148593 -1.677e-01
## 6574   0.3844494 -0.5210924 -0.1361988  2.919e-02
## 6584  -0.4157106  0.0189615  0.0927215 -1.274e-01
## 6594  -0.0043791 -0.3123345  0.1338035 -7.575e-02
## 6604   0.2473992  0.3126992  0.0050099 -2.276e-01
## 66111 -0.1656452  0.0907719  0.1506930  1.812e-01
## 6627   0.6189097  0.4187046 -0.0389922 -5.756e-01
## 6634   0.0485553  0.3388012  0.1611067 -2.550e-01
## 6644   0.0098911 -0.2630645 -0.3615846 -5.683e-01
## 6654   0.4021982  0.2778123 -0.1358907 -1.863e-01
## 6664   0.1104170  0.1722392 -0.4143285  1.840e-01
## 6674  -0.4421972  0.1184143 -0.3812743 -3.722e-01
## 6684   0.4143392  0.3089470  0.0633114 -3.648e-02
## 6694   0.1072259 -0.3087300 -0.8432562 -9.299e-02
## 6704  -0.4535735  0.3902051 -0.1564359 -1.005e-01
## 67111  0.2391657 -0.0039216 -0.0512688  2.898e-01
## 6726   0.3045470 -0.2494710  0.3333226  1.565e-01
## 6733  -0.3803952 -0.0700362 -0.2764642 -1.828e-01
## 6743  -0.1938992  0.2407342  0.1723010 -8.197e-02
## 6753   0.2478062 -0.2296037 -0.5682819 -1.492e-01
## 6763   0.1826436  0.0660646  0.2765318 -5.617e-02
## 6773   0.1293049 -0.2139758  0.1652870  3.560e-01
## 6783   0.1286962 -0.4346062 -0.4210152  2.764e-01
## 6793   0.0710888 -0.1354780  0.2778622  3.736e-01
## 6803   0.1375351 -0.1845472 -0.5133688  1.178e-01
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_gull1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), xlim=c(-3.
5,3.5), xlab="PC1 = 39%", ylab="PC2 = 30%", cex.lab=2, cex.axis=2)
with(data_gull, points(test.pca_gull1, display = "sites", col = col_points, scaling = scl, pch =
16, cex=2))
g <- vegan::scores(test.pca_gull1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1]+0.5, y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32",cex=2)
```



```
# Test for proportion of variance explained per axe
sum_all_gull <- summary(test.pca_gull1)

prop_gull <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  fec = c(1:4),
  adult = c(1:4),
  breed = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_gull[j,i+1] <- as.numeric(abs(sum_all_gull$species[i,j])/sum(abs(sum_all_gull$species
[i,])))
  }
}

prop_gull
```

```
##   PC       prim        fec      adult      breed
## 1  1 0.21615286 0.03916462 0.50373342 0.49067545
## 2  2 0.35726786 0.51982222 0.16521978 0.05346972
## 3  3 0.34875133 0.30824483 0.06288123 0.21751177
## 4  4 0.07782795 0.13276832 0.26816558 0.23834306
```

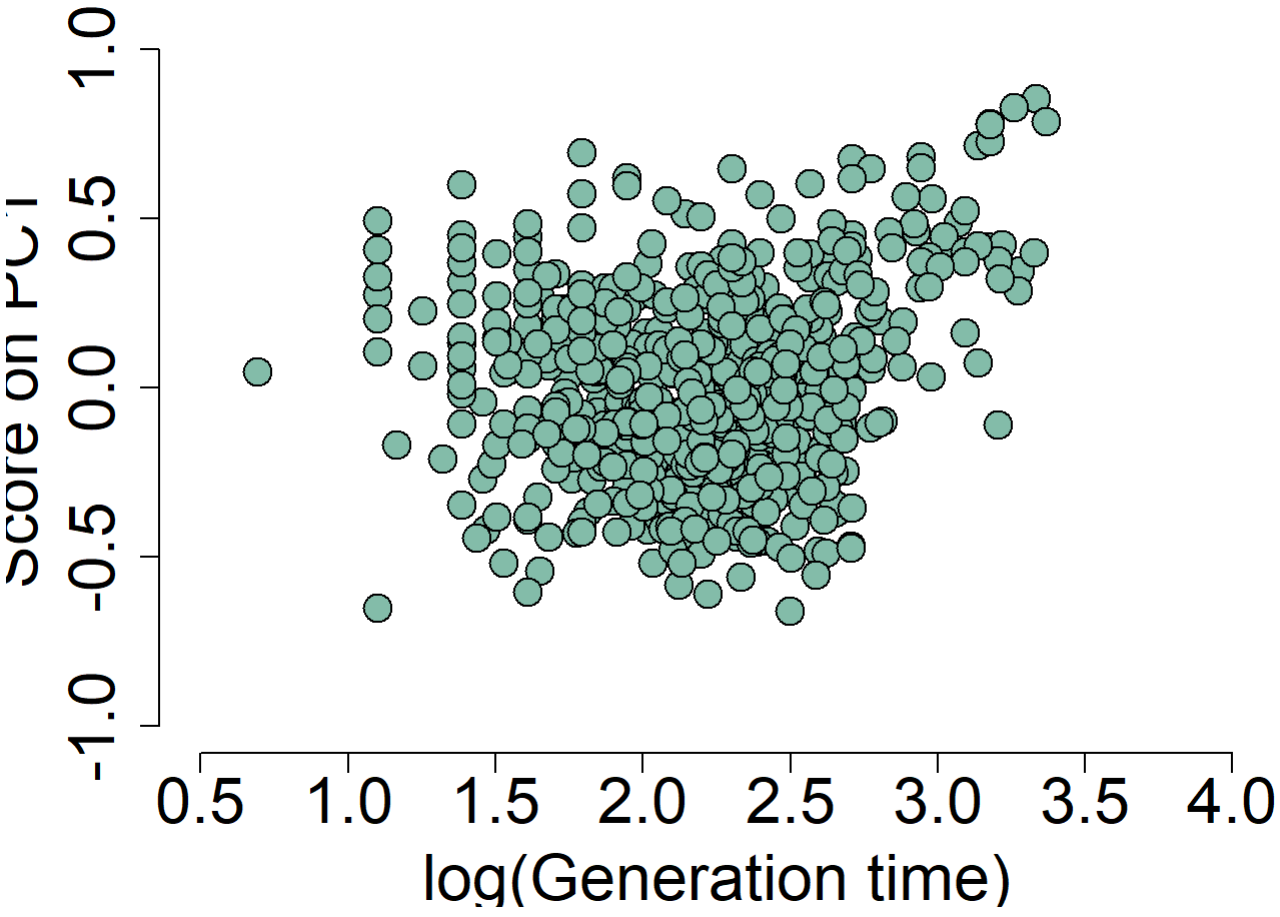
```
# Covariances
test <- as.matrix(scale(log(data_gull[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq     fec_one
## age_first_repro       1.0000000    -0.22406312 -0.1550696 -0.09148750
## lifetime_adult       -0.2240631     1.00000000 -0.1348157  0.07337074
## breed_freq           -0.1550696    -0.13481570  1.0000000  0.50642357
## fec_one              -0.0914875     0.07337074  0.5064236  1.00000000
```

```
# Correlation with generation time
individual_score_gull <- as.numeric(vegan::scores(test.pca_gull1)$sites[,1])
summary(lm(individual_score_gull ~ log(data_gull$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_gull ~ log(data_gull$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.69054 -0.20808 -0.02598  0.20550  0.73856
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                    -0.22857    0.05563  -4.109 4.47e-05 ***
## log(data_gull$generation_time)  0.10381    0.02481   4.184 3.24e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2738 on 677 degrees of freedom
## Multiple R-squared:  0.02521,    Adjusted R-squared:  0.02377
## F-statistic: 17.51 on 1 and 677 DF,  p-value: 3.242e-05
```

```
par(bty="n")
plot(log(data_gull$generation_time), individual_score_gull, pch=21, xlab="log(Generation time)",
ylab="Score on PC1", xlim=c(0.5,4), ylim=c(-1,1), bg=colors[12], cex=2, cex.axis=2, cex.lab=2)
```



Humans

```
data_humans <- data[which(data$species == "human"),]
data_humans$fec_one <- data_humans$fecundity +  1
test.pca_humans1 <- rda(log(data_humans[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_humans1)
```

```
##
## Call:
## rda(X = log(data_humans[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                           PC1    PC2    PC3     PC4
## Eigenvalue            1.724 1.0886 0.9388 0.24863
## Proportion Explained  0.431 0.2721 0.2347 0.06216
## Cumulative Proportion 0.431 0.7032 0.9378 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  5.629028
##
##
## Species scores
##
##                      PC1      PC2    PC3      PC4
## age_first_repro  0.4315 -1.73920 2.1690  0.07599
## lifetime_adult  -2.5983  0.09785 0.4769 -0.96618
## breed_freq       2.5896  0.49240 0.1881 -0.96834
## fec_one         -0.1169  2.31222 1.5713  0.30426
##
##
## Site scores (weighted sums of species scores)
##
##             PC1        PC2        PC3       PC4
## 1308  -0.238936  0.2416092  1.181e-01 -0.282546
## 2120  -0.148525  0.3800640  2.008e-01  0.012732
## 3109   0.065569  0.7233732  3.188e-01 -0.554169
## 4120   0.021711  0.4350941  3.620e-01 -0.625472
## 5109  -0.106090  0.2993480  3.903e-01 -0.297890
## 6118  -0.141904  0.6299697  1.409e-01 -0.466692
## 7109  -0.183695  0.4249012 -1.858e-02 -0.370303
## 8109  -0.292399  0.4859649 -1.029e-01 -0.183541
## 9108  -0.137955  0.2938565  2.708e-01 -0.349008
## 10109 -0.252949  0.2950080  1.582e-01 -0.124431
## 11108 -0.046286  0.3436802  4.154e-01 -0.339384
## 12104 -0.238228 -0.2553811 -3.040e-01  0.387626
## 1325   0.827773 -0.2201963 -3.384e-01 -0.209190
## 1420  -0.092367 -0.3519076 -1.818e-02 -0.251823
## 1525  -0.120978 -0.4414854 -8.636e-02 -0.193503
## 1620  -0.118565 -0.0206902 -5.720e-01  0.620847
## 1725  -0.263648 -0.0349460  3.764e-01 -0.049594
```

```
## 1825  -0.261393 -0.1533256 -4.624e-01 -0.495506
## 1920  -0.194326 -0.1946428  5.334e-01  0.438118
## 2020  -0.396930 -0.3117027  8.485e-01  0.586194
## 2124  -0.210799  0.3682221 -7.095e-02 -0.018978
## 2220   0.208217  0.7869418 -3.097e-01  0.579902
## 2320   0.368932 -0.4306910 -6.080e-02 -0.219272
## 2420  -0.318744 -0.1884521 -4.933e-01 -0.090860
## 2520  -0.133551 -0.5555191 -9.327e-02  0.703919
## 2620  -0.234483  0.0895426 -4.285e-01 -0.293458
## 2720  -0.200709 -0.4239538  3.664e-01 -0.007729
## 2820   0.130865  0.0364386 -2.682e-01  0.105821
## 2920   0.755968  1.0838698  1.490e-01  0.356551
## 3020  -0.348639  0.1705774 -2.112e-01  0.242161
## 3120   0.951394 -0.2809322 -2.993e-01  0.098111
## 3220  -0.344751  0.0532110  1.017e-01  0.144847
## 3320   0.915244 -0.0501751 -6.330e-01  0.053966
## 3420   0.809735 -0.1050569 -5.049e-01 -0.231216
## 3520   0.030483  0.5001847  2.636e-01 -0.047845
## 3619   0.221243 -0.0160317 -9.413e-02  0.936523
## 3719   0.034697  0.7321738  1.864e-01 -0.429109
## 3820  -0.115799  0.2595746  8.488e-02  0.377888
## 3919   0.392536  0.3680789  3.422e-01 -0.184335
## 4020   0.116582  0.5013923  1.071e-01  0.116503
## 4123  -0.233349 -0.5819992  2.379e-01  0.230402
## 4220  -0.305998 -0.1542041 -6.100e-02 -0.177511
## 4320   0.074892  0.0372668 -3.710e-01 -0.652291
## 4420  -0.256968 -0.2903451 -3.055e-01 -0.262456
## 4520  -0.014434 -0.4240067 -9.120e-02 -0.260403
## 4619  -0.177644 -0.5572160  2.462e-01  0.242588
## 4719  -0.361825 -0.4233173 -3.441e-02  0.107022
## 4819  -0.450536 -0.1647649 -1.901e-01  0.415630
## 4919  -0.350891  0.3744356 -3.387e-01 -0.140310
## 5019  -0.236820  0.1654234 -3.631e-01 -0.409085
## 5119  -0.209648  0.4410385 -3.288e-01  0.299506
## 5219  -0.167012 -0.1031279  5.995e-01  0.492690
## 5319   1.020456 -0.7217701  3.382e-01  0.182446
## 5419   0.234563 -0.3023449 -2.916e-01 -0.054127
## 5519  -0.327599 -0.2823929  8.004e-02 -0.128796
## 5619   0.101872  0.1436987 -1.762e-01  0.100688
## 5719  -0.310338  0.0260094 -3.143e-01 -0.338660
## 5819  -0.433947  0.2936542 -2.379e-01  0.071410
## 5919  -0.088897 -0.2180189 -4.804e-02  0.273800
## 6019  -0.330146  0.1253979 -3.911e-01  0.003777
## 6119   0.102582  0.0908903  3.874e-01  0.438621
## 6218   0.622320  0.2878289 -1.077e-02 -0.436677
## 6318   0.001990  0.1156516 -2.095e-01  0.976620
## 6418  -0.272041  0.1004968 -1.440e-01  0.315618
## 6517   0.605846 -0.2603223 -1.828e-01 -0.792877
## 6617   0.731738  0.4614626  9.264e-02 -0.035687
## 6717   0.083984  0.5893656  5.337e-02 -0.179997
## 6817   0.291376  0.4917595  3.187e-01  0.376523
## 6917   0.161532  0.5080366  1.077e-01 -0.003416
```

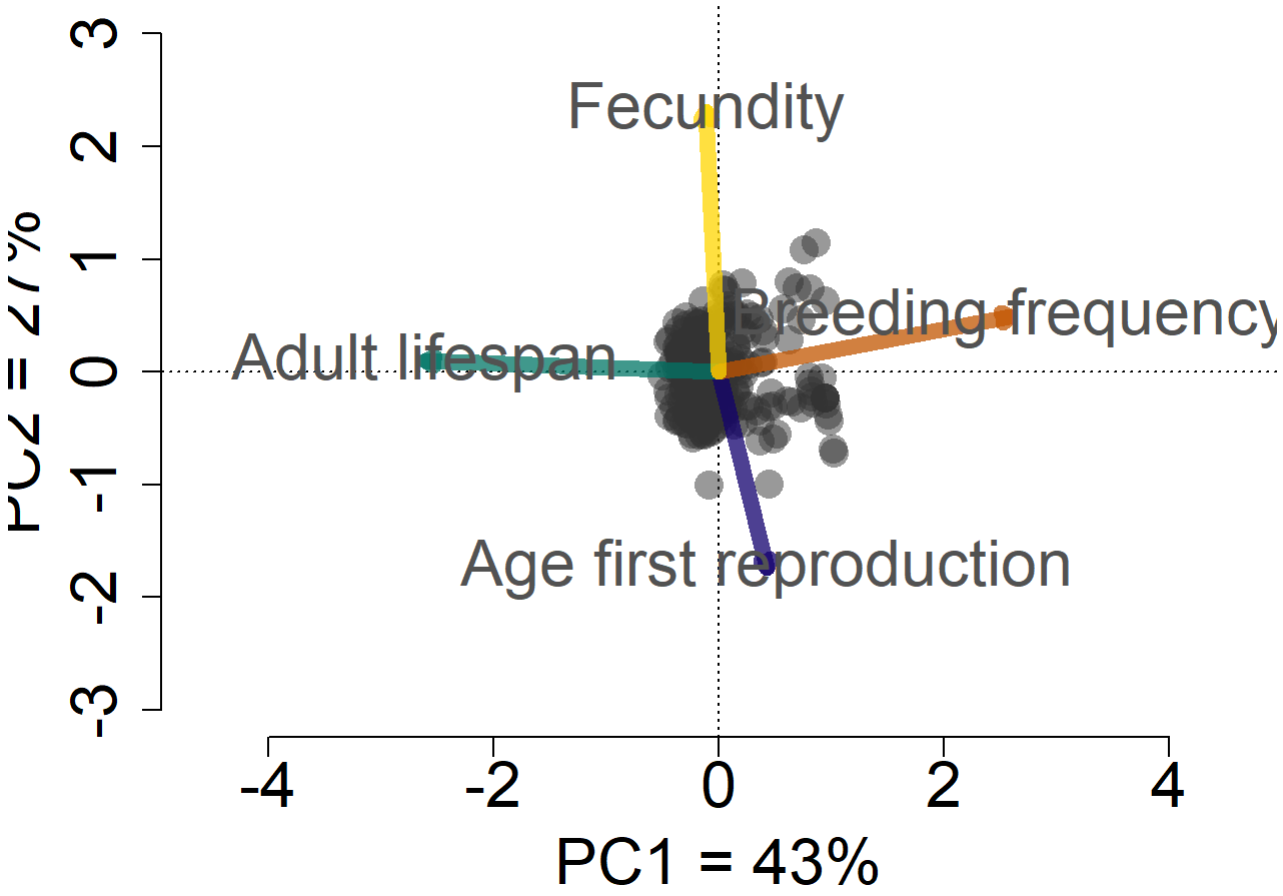
```
## 7016  -0.074621  0.2662456  2.184e-01  0.155918
## 7116  -0.069547  0.2770070  3.672e-01 -0.360007
## 7216   0.049853  0.4483063 -8.434e-02  0.716197
## 7316  -0.231589 -0.2349272  6.103e-01  0.332913
## 7416  -0.055976  0.1965778  6.421e-01 -0.396068
## 7516   0.098512  0.5526894  3.059e-01 -0.439202
## 7616  -0.231011 -0.3183976  1.339e-01  0.199498
## 7716  -0.351651  0.2497483 -1.137e-02  0.397993
## 7816  -0.013894  0.3909337  2.971e-02  0.538696
## 7916  -0.248394 -0.4160784  6.291e-02  0.089549
## 8016   0.136584 -0.4716607  6.269e-01  0.220753
## 8116  -0.324671  0.0760669 -2.367e-02  0.462404
## 8215  -0.258727 -0.0005788  2.832e-01  0.131801
## 8316   0.021546 -0.3855129 -5.033e-02 -0.750149
## 8416  -0.348024  0.1361770 -1.009e-01  0.332561
## 8515  -0.335538 -0.0035506 -3.506e-01  0.161579
## 8616  -0.106934 -0.3987684  5.552e-02 -0.106669
## 8715  -0.251337 -0.2053955  2.326e-01  0.084486
## 8816  -0.142814  0.2667454 -4.337e-02  0.514303
## 8916  -0.187800  0.4230261 -1.631e-01 -0.500900
## 9016  -0.258142  0.2953178  1.599e-01 -0.137822
## 9116  -0.239972  0.2369917  3.593e-01 -0.080179
## 9215  -0.230394  0.2379276  2.349e-01 -0.078237
## 9315   0.461326 -0.1856678 -5.196e-01  0.323733
## 9414   0.003854  0.0884962  4.406e-01 -0.573786
## 9514   0.007259  0.2473510  2.070e-01 -0.416564
## 9614   0.479364 -0.3008072 -3.531e-01  0.345760
## 9715  -0.297777  0.3531938 -2.048e-01 -0.285212
## 9815  -0.098641 -0.3775939  9.238e-01  0.094897
## 9915  -0.187096  0.1261142 -1.387e-01  0.267919
## 10015  0.355451  0.4709236  1.652e-01  0.247032
## 10115  0.261516  0.0648495 -8.875e-01  0.243042
## 10215  0.942956 -0.2270662 -3.772e-01  0.087806
## 10315 -0.444357 -0.2261382  1.487e-02  0.310892
## 10415  0.818959 -0.1639355 -4.197e-01 -0.219953
## 10515  0.271644 -0.3045565 -3.041e-01  0.041485
## 10615  0.002432 -0.0601524  6.492e-02  0.144054
## 10715 -0.337885 -0.0358677  3.269e-02  0.037693
## 10815 -0.220701  0.2013504 -6.924e-02  0.198467
## 10914 -0.208860 -0.0437413  1.316e-01 -0.183941
## 11014 -0.366001  0.1693217 -2.164e-01  0.463066
## 11114 -0.505705 -0.0376496 -4.964e-01  0.273253
## 11214 -0.206288 -0.2669129 -1.723e-01 -0.145479
## 11313  0.031298 -0.0386782 -7.609e-01  0.287544
## 11414 -0.312199  0.1094221  2.671e-01  0.041611
## 11514 -0.222824 -0.1709281  5.679e-01  0.158550
## 11614 -0.328682  0.1863488  7.532e-02  0.183581
## 11714 -0.437373  0.0330619 -3.079e-01  0.360749
## 11814 -0.066856  0.3777380  3.256e-01 -0.394517
## 11914 -0.101619  0.2921542  2.312e-04 -0.382454
## 12014 -0.148970 -0.5363122  6.908e-02 -0.286393
## 12114 -0.214403 -0.2743662  1.765e-01 -0.103220
```

```
## 12214  0.182611  0.0126023 -7.333e-01 -0.186698
## 12314  0.942956 -0.2270662 -3.772e-01  0.087806
## 12413 -0.050254 -0.2954853  3.479e-01 -0.290396
## 12514 -0.099695 -0.4161414  6.463e-01 -0.261157
## 12614  0.160153  0.0640930  3.563e-03  0.328813
## 12714 -0.250467 -0.1465313 -1.928e-01 -0.226304
## 12814 -0.133686 -0.5523837  4.416e-02 -0.029686
## 12912 -0.070012 -0.5322487 -7.940e-02  0.479881
## 1309  -0.397026  0.1038214  2.923e-02 -0.001399
## 13111  0.043530 -0.1630732 -1.073e-02 -0.285531
## 1326  -0.236178 -0.5462707  7.871e-02 -0.293958
## 1335  -0.049054 -0.5128185  7.381e-02 -0.450934
## 1345   0.014918  0.0706259 -8.161e-01 -0.264782
## 1355  -0.089359 -1.0009334  7.466e-01 -0.231652
## 1365  -0.130308 -0.5121668  2.963e-01 -0.423704
## 1375   0.028895 -0.4629407 -1.467e-02 -0.343089
## 1385  -0.182379 -0.1945913  2.971e-05 -0.031209
## 1395  -0.227530  0.0393812 -1.764e-01 -0.412066
## 1405  -0.086051  0.0787775  8.656e-02 -0.306017
## 14111 -0.168900  0.0549455 -3.936e-02 -0.457811
## 1425  -0.033946 -0.3969828  3.495e-01  0.146519
## 1435   1.014537 -0.6839864  2.836e-01  0.175218
## 1445  -0.341822 -0.3875343  5.060e-01  0.444311
## 1455  -0.276545 -0.1186465 -1.916e-01  0.524576
## 1465  -0.441841 -0.3932248  7.006e-01  0.656344
## 1475  -0.308485 -0.4506945  3.672e-01 -0.029656
## 1485  -0.085869 -0.1734989  5.471e-01 -0.083940
## 1495   0.149052  0.2232760 -1.209e-01  0.076152
## 1505   0.208774  0.3615355 -1.688e-01  0.238350
## 15111 -0.297282  0.2143526 -8.236e-01  0.007865
## 1526   0.942956 -0.2270662 -3.772e-01  0.087806
## 1535   0.188419  0.1181422 -9.030e-02  0.413661
## 1545  -0.029944  0.5189172  1.779e-02 -0.129689
## 1555  -0.329880  0.0751032 -1.537e-01  0.339767
## 1565   0.098943 -0.2359922 -4.913e-01  0.420480
## 1575  -0.292263 -0.0721580  1.162e-01  0.079627
## 1585   0.216767 -0.4529932  2.758e-01 -0.454213
## 1594  -0.139697 -0.2602090  6.024e-02 -0.122913
## 1605  -0.455318  0.2662630 -7.478e-01 -0.072383
## 16111 -0.139342 -0.2583500 -2.943e-01 -0.518328
## 1625   0.152134 -0.1834401  5.545e-02  0.113741
## 1634   0.974748 -0.4300055 -8.370e-02  0.126630
## 1645   0.068376 -0.3295914  1.003e-01 -0.796077
## 1655   0.011437  0.0368138  1.517e-01 -0.163426
## 1665   0.729123 -0.3188591 -1.469e-01 -0.485996
## 1675  -0.284612  0.1044205 -4.087e-01 -0.231944
## 1685  -0.370263  0.4347349 -1.386e-01  0.102835
## 1695   0.252485  0.3309285  7.703e-02  0.143801
## 1705  -0.197104  0.1767076  2.999e-01 -0.007727
## 17111  0.005022 -0.0330531  1.951e-01  0.405799
## 1726   0.151021  0.2466263  4.146e-01 -0.289021
## 1734   0.033284  0.7754989 -2.918e-01  0.797986
```

```
## 1745   0.338433 -0.3447330  5.920e-02 -1.503937
## 1755   0.448289 -0.9928069  7.072e-01  0.116705
## 1765  -0.225020 -0.3442534 -2.271e-01 -0.245541
## 1775   0.124370 -0.3298140 -2.989e-01  0.149685
## 1785  -0.076138 -0.0589399  2.146e-01 -0.283415
## 1795  -0.186188 -0.1612586 -3.502e-01 -0.276639
## 1804  -0.199779  0.0231595 -3.429e-01 -0.217780
## 18111 -0.351943  0.1799664 -7.078e-02  0.498241
## 1826   0.407062  0.3033799  1.479e+00 -0.715090
## 1835   0.439565 -0.3108408  6.087e-01  0.160578
## 1845  -0.196200  0.2777798  6.014e-03 -0.339431
## 1855   0.164112  0.4862850  8.390e-02  0.163404
## 1865   0.940826  0.6322496  7.534e-01  0.738631
## 1875   0.836212 -0.2740623 -2.605e-01 -0.198885
## 1884  -0.321646  0.0266839 -3.105e-01 -0.367819
## 1894   0.388837  0.0912655  1.008e-01  0.391192
## 1904   0.178557 -0.1339743 -5.512e-01 -0.014604
## 19111 -0.192730 -0.0499100 -4.072e-01 -0.094478
## 1924  -0.153121 -0.0133710 -2.362e-01 -0.334483
## 1934  -0.339115  0.1229813 -5.345e-01 -0.372766
## 1944  -0.191387 -0.1721002  2.340e-01  0.466104
## 1954  -0.281065  0.1310468 -3.826e-01 -0.388021
## 1964  -0.135912 -0.1756321  7.697e-03 -0.079987
## 1974  -0.162754 -0.2397706  4.085e-01 -0.106543
## 1984  -0.282978  0.4167321 -1.650e-01 -0.051499
## 1994  -0.117232 -0.0846314 -6.301e-02  0.400225
## 2004   0.371623  0.0846289 -8.903e-01  0.149305
## 20111 -0.280462 -0.3710358  1.050e-01  0.101676
## 2024   0.653651 -0.2631736 -1.989e-01 -0.669612
## 2034  -0.186976 -0.2820494  2.437e-01  0.765540
## 2044   0.860431  1.1454305  1.121e-02  0.640456
## 2054  -0.080709  0.1359985 -4.370e-01  0.139744
## 2064  -0.147650  0.3763045  1.970e-01  0.030439
## 2074  -0.076287  0.0078868 -2.584e-01  0.349952
## 2084  -0.057985 -0.0808468 -3.249e-01  0.112025
## 2094   0.056377  0.0443532 -1.172e-01  0.242111
## 21010  0.942956 -0.2270662 -3.772e-01  0.087806
## 21111 -0.188362  0.3322872  1.736e-01 -0.077810
## 2125  -0.013108 -0.0744589 -3.215e-01 -0.092513
## 2134  -0.288990  0.2706272 -6.003e-01 -0.120077
## 2144  -0.332092  0.1755409 -3.475e-01 -0.082826
## 2154  -0.374580 -0.4326180  7.765e-02  0.006978
## 2164  -0.281811 -0.4614053  1.458e-01 -0.006775
## 2174  -0.218491 -0.4387275  7.294e-01  0.065326
## 2184  -0.311848 -0.1285792 -3.146e-01  0.168337
## 2194  -0.014365 -0.3033210 -1.376e-01  0.454065
## 2204  -0.322502  0.1823372 -3.421e-01 -0.136426
## 22111 -0.180732  0.2052312  7.979e-02 -0.351956
## 2224  -0.375738  0.2230535 -2.275e-02  0.248530
## 2234  -0.148520  0.4508838 -4.677e-01 -0.575681
## 2244  -0.015507  0.1124806  3.383e-01 -0.235507
## 2254   0.695201  0.7433960  6.901e-01  0.126004
```

```
## 2264  -0.149918  0.1812152  1.866e-01 -0.454640
## 2274  -0.022675  0.4633958  1.265e-01 -0.515088
## 2284   0.142723 -0.1510820 -5.643e-01  0.168851
## 2294  -0.059398  0.4205073  9.181e-02 -0.298438
## 2304  -0.302007  0.2541697 -1.500e-04 -0.103046
## 23111 -0.356044 -0.2072613  2.393e-01  0.446150
## 2324  -0.076232 -0.1558036 -2.229e-01 -0.568562
## 2334   0.045901 -0.1437128  1.348e-01 -0.638798
## 2344   0.518367 -0.5497755  6.931e-03  0.393389
## 2354  -0.099009 -0.4799523  8.091e-02  0.382226
## 2364   0.800061 -0.0433052 -5.942e-01 -0.243030
## 2374   0.367413 -0.6111173  9.004e-02  0.372359
## 2384   0.810383  0.7365260  6.513e-01  0.423000
## 2394   0.250115  0.5194964  7.704e-02  0.631066
## 2404   0.619729  0.7990814  6.381e-01 -0.057611
## 24111 -0.090972 -0.4215441 -2.123e-01  0.317022
## 2424   0.477520 -0.5913379  8.728e-02  0.278621
## 2434   0.085884 -0.3086370 -2.613e-01 -0.220193
## 2444  -0.233948 -0.0941452  8.713e-02  0.074476
## 2454  -0.367779  0.0236036  8.244e-02  0.148662
## 2464   0.039232 -0.1990396 -4.276e-01 -0.212103
## 2474  -0.174822  0.3188347  3.286e-02 -0.287498
## 2484  -0.144153 -0.1519693  1.256e-01  0.514786
## 2494  -0.072122  0.1356082  2.454e-01 -0.102689
## 2504   0.051866 -0.0227787 -2.620e-02 -0.194902
## 25111  0.967265 -0.3822391 -1.528e-01  0.117492
## 2524   0.572366  0.5646284  1.013e+00 -0.230666
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_humans1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), xlim=c(-
3.5,3.5), xlab="PC1 = 43%", ylab="PC2 = 27%", cex.axis=2, cex.lab=2)
with(data_humans, points(test.pca_humans1, display = "sites", col = col_points, scaling = scl, p
ch = 16, cex=2))
g <- vegan::scores(test.pca_humans1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_humans <- summary(test.pca_humans1)

prop_humans <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_humans[j,i+1] <- as.numeric(abs(sum_all_humans$species[i,j])/sum(abs(sum_all_humans$spe
cies[i,])))
  }
}

prop_humans
```

```
##   PC       prim      adult      breed       freq
## 1  1 0.09772028 0.62771656 0.61098595 0.02716612
## 2  2 0.39386436 0.02364015 0.11617626 0.53714018
## 3  3 0.49120584 0.11522275 0.04436976 0.36501258
## 4  4 0.01720952 0.23342054 0.22846803 0.07068112
```

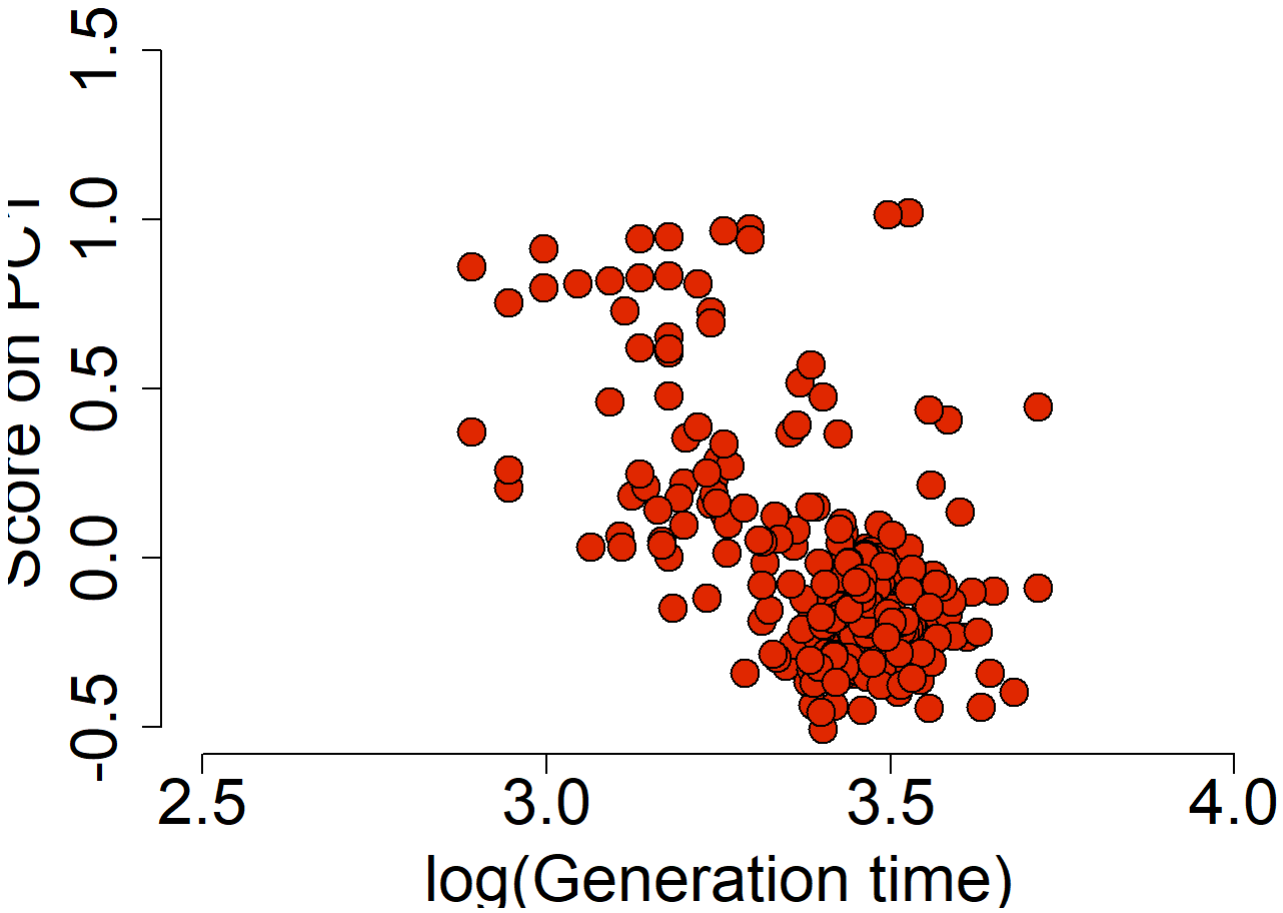
```
# Covariances
test <- as.matrix(scale(log(data_humans[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq    fec_one
## age_first_repro      1.00000000    -0.04169533  0.07515743 -0.0808719
## lifetime_adult      -0.04169533     1.00000000 -0.71387769  0.1244106
## breed_freq           0.07515743    -0.71387769  1.00000000  0.1056071
## fec_one             -0.08087190     0.12441062  0.10560711  1.0000000
```

```
# Correlation with generation time
individual_score_humans <- as.numeric(vegan::scores(test.pca_humans1)$sites[,1])
summary(lm(individual_score_humans~ log(data_humans$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_humans ~ log(data_humans$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.49226 -0.19120 -0.03396  0.11925  1.20814
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       4.7212     0.3978   11.87   <2e-16 ***
## log(data_humans$generation_time)  -1.3921     0.1172  -11.88   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2846 on 250 degrees of freedom
## Multiple R-squared:  0.3609, Adjusted R-squared:  0.3583
## F-statistic: 141.2 on 1 and 250 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_humans$generation_time), individual_score_humans, pch=21, xlab="log(Generation tim
e)", ylab="Score on PC1", xlim=c(2.5,4), ylim=c(-0.5,1.5), bg=colors[9], cex=2, cex.axis=2, cex.
lab=2)
```



Wandering albatross

```
data_WA <- data[which(data$species == "wanderingalbatross"),]
data_WA$fec_one <- data_WA$fecundity +  1
test.pca_WA1 <- rda(log(data_WA[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_WA1)
```

```
##
## Call:
## rda(X = log(data_WA[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                           PC1    PC2    PC3     PC4
## Eigenvalue            2.068 0.9921 0.7849 0.15518
## Proportion Explained  0.517 0.2480 0.1962 0.03879
## Cumulative Proportion 0.517 0.7650 0.9612 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  7.21909
##
##
## Species scores
##
##                     PC1      PC2     PC3       PC4
## age_first_repro  0.5295  3.54798  0.4003 -0.008546
## lifetime_adult   3.3586 -0.13730 -0.8334 -1.017343
## breed_freq      -3.3074  0.07181  1.0501 -0.990997
## fec_one         -2.1075  0.55988 -2.8756 -0.068221
##
##
## Site scores (weighted sums of species scores)
##
##              PC1        PC2        PC3       PC4
## 1300  -2.870e-02 -1.781e-01  2.095e-01 -0.444451
## 2105  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 3104   1.864e-01  2.931e-01  4.368e-02 -0.136113
## 4104   9.422e-02 -1.562e-01 -1.249e-01  0.608720
## 5104  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 6104   3.639e-01  1.356e-01 -7.633e-02 -0.026503
## 7104   2.257e-01  1.648e-01 -1.483e-01  0.168219
## 8104  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 9104   2.655e-02  3.469e-02 -1.503e-01  0.173244
## 10104  3.268e-01 -1.843e-01 -1.876e-01  0.412061
## 11104 -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 12100  1.468e-01  1.595e-01  2.359e-03  0.116088
## 1316  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 1416   2.950e-01 -3.847e-01 -1.738e-01  0.115530
## 1516   1.866e-01  1.726e-01 -1.700e-01 -0.032839
## 1616  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 1716   1.918e-01  1.346e-01  1.641e-01  0.135495
```

```
## 1816   4.117e-02  1.756e-01 -4.897e-03 -0.085864
## 1915   1.232e-01 -1.618e-01 -1.294e-01 -0.141564
## 2015   1.644e-02  1.425e-01  3.108e-01 -0.564740
## 2115   1.249e-02 -2.020e-01  3.705e-01 -0.267907
## 2215  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 2315  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 2415  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 2515   1.373e-01 -3.976e-02  3.586e-01 -0.037173
## 2614   1.156e-01 -1.866e-01  9.760e-02 -0.251759
## 2714  -3.387e-01  2.585e-01 -2.464e-01 -0.509707
## 2814   1.254e-01  4.518e-01 -1.055e-01  0.094378
## 2914   2.301e-01  1.624e-01 -1.419e-01 -0.258535
## 3014   3.429e-01 -2.291e-01  1.937e-01  0.659098
## 3114   1.800e-01  5.648e-01 -1.025e-01  0.023651
## 3214  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 3314   2.371e-01 -3.565e-03 -9.876e-02 -0.248295
## 3414  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 3514   2.552e-01  1.485e-01 -4.239e-02  0.180927
## 3614   2.021e-01 -1.654e-01 -1.954e-01  0.173304
## 3714   1.494e-01 -3.333e-02  2.913e-01  0.226233
## 3814   2.289e-01 -1.288e-02 -8.444e-05 -0.007384
## 3914   2.122e-01 -9.223e-03 -2.305e-02 -0.599153
## 4014  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 4114   1.232e-01 -1.707e-01 -4.473e-02  0.121173
## 4214  -8.031e-02  2.397e-01  8.688e-01 -0.191532
## 4314  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 4414   2.047e-01 -1.382e-02  4.958e-02  0.435056
## 4514   3.915e-02  7.931e-03  6.086e-02 -0.266878
## 4614   2.173e-01  5.523e-03 -1.579e-01 -0.473628
## 4714   1.544e-01  1.403e-02 -1.312e-01  0.413361
## 4814  -1.745e-02 -3.890e-01  2.735e-01 -0.054889
## 4914  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 5014  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 5114   1.529e-02 -2.426e-01  7.171e-01 -0.706330
## 5214   2.472e-01 -3.301e-02  1.511e-01 -0.148653
## 5314  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 5414   3.772e-02  1.906e-01 -1.280e-01  0.170843
## 5514   2.586e-01 -1.874e-01 -8.437e-02 -0.273790
## 5614   3.505e-01  1.459e-01 -1.405e-01  0.406976
## 5714   1.747e-01 -3.695e-01 -1.522e-01 -0.013544
## 5814   2.802e-01 -1.190e-03 -1.651e-01  0.295596
## 5914   7.109e-02 -1.712e-01  2.983e-02  0.200524
## 6014   6.834e-02 -3.458e-01 -2.192e-01  0.106660
## 6113   2.122e-01 -5.742e-03 -5.241e-02 -0.527878
## 6213  -8.116e-02 -1.483e-01  2.184e-02 -0.091514
## 6313   1.876e-01  1.511e-01  1.623e-02 -0.179232
## 6413   2.316e-01 -1.817e-01 -8.948e-02  0.186012
## 6512   2.913e-01 -1.075e-02 -1.062e-01 -0.221931
## 6612   3.372e-01 -3.276e-02  3.985e-02  0.320192
## 6712  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 6812   2.721e-01  2.793e-01  4.816e-02 -0.347768
## 6912   3.450e-01 -1.858e-01 -1.995e-01  0.338810
```

```
## 7012   2.830e-01  5.450e-01 -6.629e-02 -0.137753
## 7112   1.807e-01 -2.135e-02  1.418e-01  0.137895
## 7212   2.105e-01 -1.201e-02  7.591e-03 -0.422063
## 7312   1.917e-01  5.414e-01  8.704e-02 -0.089853
## 7412   3.189e-01  1.395e-01 -4.381e-02  0.305083
## 7512  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 7612  -2.870e-02 -1.781e-01  2.095e-01 -0.444451
## 7712   2.159e-01  1.421e-01  7.181e-02  0.432655
## 7812   1.411e-01  2.063e-02 -1.801e-01  0.032031
## 7912  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 8012   1.602e-01 -1.712e-01 -9.122e-02  0.048365
## 8112   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 8312  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 8412   1.995e-01  1.671e-01 -1.311e-01  0.274255
## 8612  -4.487e-01  5.393e-01 -1.234e-01  0.008192
## 8711  -4.086e-02  8.748e-03  1.588e-01 -0.298984
## 8812   1.372e-01  4.438e-01 -3.930e-02  0.599480
## 8912  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 9012   1.411e-01  2.063e-02 -1.801e-01  0.032031
## 9112  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 9211   2.160e-01 -5.855e-04 -9.467e-02 -0.129060
## 9311   2.692e-01 -1.265e-03 -1.471e-01  0.431048
## 9411   1.232e-01 -1.618e-01 -1.294e-01 -0.141564
## 9511   2.257e-01 -1.692e-01 -2.025e-01 -0.287966
## 9611   2.360e-01  7.079e-03 -1.846e-01  0.083981
## 9712   1.721e-01 -1.993e-01  1.550e-01  0.642302
## 9812   3.766e-02  5.429e-01  2.846e-01  0.259232
## 9912   1.522e-01  1.765e-01 -1.579e-01  0.029630
## 10012 -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 10112  3.467e-01  5.277e-01  1.155e-02  0.299104
## 10212 -8.543e-02  2.074e-01 -1.133e-01  0.224109
## 10312 -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 10412 -4.487e-01  5.393e-01 -1.234e-01  0.008192
## 10512  7.109e-02 -1.712e-01  2.983e-02  0.200524
## 10612  1.165e-01 -1.794e-01  3.608e-02 -0.090000
## 10712  8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 10812 -1.277e-01 -1.857e-01  4.058e-01 -0.554756
## 10912 -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 11012  1.427e-01 -3.618e-01 -1.818e-01 -0.176508
## 11112  1.252e-02 -3.640e-01  7.827e-03 -0.261151
## 11212 -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 11311 -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 11412  2.315e-01 -1.735e-01 -1.687e-01 -0.126689
## 11512  3.377e-03 -3.522e-01 -8.016e-02 -0.077736
## 11612 -7.432e-05 -3.372e-01 -2.033e-01  0.178971
## 11712 -2.747e-01  3.862e-02  2.041e-01 -0.261643
## 11812  8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 11912 -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 12012 -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 12112 -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 12212 -3.013e-01 -3.333e-01  1.511e-01 -0.255916
## 12312 -8.116e-02 -1.483e-01  2.184e-02 -0.091514
```

```
## 12411 -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 12512  1.602e-01 -1.712e-01 -9.122e-02  0.048365
## 12612 -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 12712 -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 12812 -2.747e-01  3.862e-02  2.041e-01 -0.261643
## 12910 -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 1303   7.109e-02 -1.712e-01  2.983e-02  0.200524
## 1317   2.542e-01  5.532e-03 -1.964e-01  0.010730
## 1323  -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 1333   4.117e-02  1.756e-01 -4.897e-03 -0.085864
## 1343  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 1353  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 1363   2.021e-01 -1.654e-01 -1.954e-01  0.173304
## 1373  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 1383   3.162e-03  4.303e-02 -2.007e-01 -0.176121
## 1393   2.021e-01 -1.654e-01 -1.954e-01  0.173304
## 1403   1.369e-01 -2.076e-01  2.664e-01  0.228917
## 1417  -6.272e-02  4.864e-02 -1.576e-01  0.089805
## 1423  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 1433   7.109e-02 -1.712e-01  2.983e-02  0.200524
## 1443   8.327e-02 -1.455e-01 -2.204e-01 -0.103385
## 1453  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 1463   7.109e-02 -1.712e-01  2.983e-02  0.200524
## 1473  -5.221e-01 -4.864e-01 -2.697e-01  0.023988
## 1483   2.472e-01  1.630e-01 -1.623e-01  0.081580
## 1493   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 1503  -1.141e-01 -2.315e-01  8.016e-01 -0.184275
## 1517  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 1523   2.451e-01 -6.059e-01 -2.269e-01 -0.035645
## 1533  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 1543  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 1553  -6.868e-02  2.604e-02  4.669e-02 -0.094198
## 1563  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 1573  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 1583  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 1592  -5.221e-01 -4.864e-01 -2.697e-01  0.023988
## 1603  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 1617  -6.868e-02  2.604e-02  4.669e-02 -0.094198
## 1623   6.269e-02 -5.857e-01 -1.672e-01 -0.155441
## 1632  -5.221e-01 -4.864e-01 -2.697e-01  0.023988
## 1643   1.030e-01  1.714e-01 -5.039e-02 -0.111112
## 1653  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 1663  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 1673  -1.663e-03 -3.996e-01  3.423e-01 -0.264864
## 1683  -2.033e-01 -3.652e-01  3.007e-01 -0.426896
## 1693   1.781e-01 -3.857e-01 -3.449e-03  0.440783
## 1703  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 1717   8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 1723  -7.432e-05 -3.372e-01 -2.033e-01  0.178971
## 1732  -2.942e-02 -3.515e-01 -4.941e-02 -0.354398
## 1743  -3.013e-01 -3.333e-01  1.511e-01 -0.255916
## 1753   3.281e-01 -1.861e-01 -1.702e-01  0.571378
```

```
## 1763  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 1773   1.357e-01  3.563e-03 -1.987e-02  0.118489
## 1783   1.584e-01 -2.095e-01  2.524e-01  0.142279
## 1793  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 1802  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 1817  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 1823   5.367e-02 -3.801e-01  1.006e-01 -0.056041
## 1833  -6.293e-02 -6.642e-01  6.876e-01 -0.507099
## 1843  -2.793e-02 -3.731e-01  1.540e-01  0.273338
## 1853   2.234e-01 -1.018e-02 -3.039e-02 -0.644444
## 1863   7.931e-02 -1.588e-01 -9.747e-02 -0.106027
## 1873  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 1882  -1.641e-02 -5.653e-01 -2.358e-01  0.182484
## 1892   2.484e-01 -3.779e-01 -1.746e-01  0.025444
## 1902  -3.177e-01 -5.614e-01  1.186e-01 -0.252403
## 1916   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 1922  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 1932  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 1942  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 1952  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 1962   9.179e-02  1.551e-02 -7.262e-02 -0.108711
## 1972  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 1982   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 1992   2.120e-01 -1.727e-01 -1.489e-01 -0.074570
## 2002   1.461e-01 -3.688e-01 -1.194e-01  0.051408
## 2016   8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 2022   1.232e-01 -1.707e-01 -4.473e-02  0.121173
## 2032   1.772e-01 -3.576e-01 -2.638e-01 -0.139310
## 2042   1.979e-01 -3.703e-01 -1.771e-01 -0.071527
## 2052   1.758e-01 -1.632e-01 -1.782e-01  0.279340
## 2062   8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 2072   2.338e-01 -3.783e-01 -1.498e-01  0.100236
## 2082   8.602e-02 -1.751e-01  3.225e-02 -0.395073
## 2092  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 2106   6.834e-02 -3.458e-01 -2.192e-01  0.106660
## 2116  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2122  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 2132  -8.116e-02 -1.483e-01  2.184e-02 -0.091514
## 2142  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2152  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 2162  -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 2172   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 2182  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 2192   3.661e-01 -4.115e-01 -2.369e-02  0.438158
## 2202   1.232e-01 -1.618e-01 -1.294e-01 -0.141564
## 2216   2.146e-01  8.908e-03 -1.705e-01  0.170620
## 2222  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2232  -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 2242  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2252  -6.868e-02  2.604e-02  4.669e-02 -0.094198
## 2262  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2272  -4.579e-01  4.106e-01 -1.418e-01  0.010175
```

```
## 2282  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2292   2.013e-01  2.379e-03 -9.915e-02 -0.019271
## 2302  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2316  -2.635e-01  1.945e-01  2.263e-01 -0.264044
## 2322   6.834e-02 -3.458e-01 -2.192e-01  0.106660
## 2332   1.248e-01 -2.141e-01  3.338e-01 -0.034489
## 2342  -7.432e-05 -3.372e-01 -2.033e-01  0.178971
## 2352  -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 2362   6.723e-02 -3.652e-01 -5.344e-02 -0.263459
## 2372   8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 2382  -8.116e-02 -1.483e-01  2.184e-02 -0.091514
## 2392  -1.141e-01 -2.315e-01  8.016e-01 -0.184275
## 2402  -2.196e-01 -5.933e-01  2.681e-01 -0.423383
## 2416   1.035e-01 -3.902e-01  1.178e-01 -0.378380
## 2422  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2432  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2442  -1.745e-02 -3.890e-01  2.735e-01 -0.054889
## 2452   2.493e-01 -2.197e-01  2.297e-01  0.462335
## 2462  -4.182e-01  9.650e-01 -6.270e-02  0.001637
## 2472   9.422e-02 -1.562e-01 -1.249e-01  0.608720
## 2482  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 2492  -2.261e-01 -6.503e-01  7.943e-01  0.151660
## 2502  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2516  -1.245e-01 -3.316e-01 -9.923e-02 -0.317853
## 2522  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 2531   4.782e-02  3.316e-01 -1.079e-01  0.168671
## 2541   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 2551   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 2561  -5.751e-02  1.820e-01  6.892e-02 -0.096599
## 2571  -8.116e-02 -1.483e-01  2.184e-02 -0.091514
## 2581  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2591  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2601  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 2615  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 2621   7.109e-02 -1.712e-01  2.983e-02  0.200524
## 2631  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 2641  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 2651  -4.402e-01  6.578e-01 -1.065e-01  0.006368
## 2661  -1.141e-01 -2.315e-01  8.016e-01 -0.184275
## 2671   7.931e-02 -1.588e-01 -9.747e-02 -0.106027
## 2681  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 2691  -4.402e-01  6.578e-01 -1.065e-01  0.006368
## 2701   9.422e-02 -1.562e-01 -1.249e-01  0.608720
## 2715  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 2721   6.516e-02 -3.564e-01 -1.256e-01 -0.102984
## 2731  -3.301e-03 -1.914e-01  3.017e-01 -0.057932
## 2741  -8.543e-02  2.074e-01 -1.133e-01  0.224109
## 2751   2.867e-01  2.660e-01  1.453e-01 -0.430289
## 2761   3.945e-01  2.707e-01 -3.562e-02 -0.268075
## 2771   3.562e-01  2.811e-01 -7.861e-02 -0.324395
## 2781   3.123e-01  2.876e-01 -7.603e-02 -0.217583
## 2791   1.649e-01  1.519e-01  2.868e-02 -0.668303
```

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## 2801   2.630e-01 -3.518e-03 -1.389e-01 -0.506426
## 2815  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 2821   2.449e-01  1.569e-01 -1.188e-01 -0.564603
## 2831   2.608e-01  2.111e-05 -1.603e-01 -0.176597
## 2851  -5.221e-01 -4.864e-01 -2.697e-01  0.023988
## 2861   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 2871   3.163e-01  1.289e-01  6.000e-02  0.632319
## 2881   1.530e-01 -6.298e-01  1.045e-01 -0.171925
## 2891   2.034e-02  1.388e-01  3.488e-01 -0.063017
## 2901  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2915  -3.976e-01  1.066e-01 -2.375e-01 -0.314632
## 2921   1.488e-01 -3.552e-01 -2.452e-01 -0.024711
## 2931  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 2941   2.047e-01 -1.382e-02  4.958e-02  0.435056
## 2951   1.369e-01 -2.076e-01  2.664e-01  0.228917
## 2961  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 2971  -1.499e-02  4.458e-02 -1.888e-01 -0.102870
## 2981  -4.086e-02  8.748e-03  1.588e-01 -0.298984
## 2991   2.130e-01 -1.837e-01 -4.465e-02  0.295367
## 3015  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 3021  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 3031  -1.892e-01 -1.676e-01  3.288e-01 -0.429939
## 3041  -1.663e-03 -3.996e-01  3.423e-01 -0.264864
## 3051   1.780e-01  1.963e-02 -2.343e-01 -0.631374
## 3061   2.671e-01 -1.096e-02 -7.822e-02 -0.502159
## 3071  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 3091   3.523e-01 -1.933e-01 -1.463e-01  0.196595
## 3105   2.385e-01 -1.712e-01 -2.070e-01 -0.508931
## 3115   2.196e-01  2.925e-01 -6.312e-03 -0.674355
## 3121  -2.747e-01  3.862e-02  2.041e-01 -0.261643
## 3131  -4.487e-01  5.393e-01 -1.234e-01  0.008192
## 3141  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 3151  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 3161  -3.765e-01 -2.693e-01 -3.217e-01 -0.501580
## 3171   2.465e-01 -1.791e-01 -1.169e-01  0.900758
## 3181   8.007e-02 -3.538e-01 -1.530e-01  0.611763
## 3191   2.655e-02  3.469e-02 -1.503e-01  0.173244
## 3201  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 3215  -1.304e-03 -1.233e-03  2.070e-01  0.267611
## 3221  -3.284e-01 -7.461e-02 -3.157e-01 -0.641327
## 3231  -1.016e-01 -5.725e-02  8.265e-01 -0.186959
## 3241  -2.872e-01 -1.357e-01  1.793e-01 -0.258959
## 3251   1.278e-01 -3.579e-01 -1.842e-01  0.419088
## 3261  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 3271   3.075e-01 -2.052e-01  1.534e-02  0.041807
## 3281   2.338e-01 -3.783e-01 -1.498e-01  0.100236
## 3291   1.995e-01  1.671e-01 -1.311e-01  0.274255
## 3301  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 3315  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 3321   1.221e-01 -1.689e-01 -6.823e-02 -0.282804
## 3331  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 3341  -1.957e-01 -2.246e-01  8.550e-01  0.145104
```

```
## 3361   2.503e-01  1.404e-01  2.774e-02 -0.203844
## 3371   2.875e-01 -1.954e-01 -5.252e-02 -0.301269
## 3381   8.289e-02 -2.225e-01  4.487e-01 -0.740159
## 3391   3.381e-01  1.285e-01  2.050e-02 -0.030529
## 3401   3.461e-01  5.259e-01  1.715e-02 -0.214438
## 3415   2.912e-01 -1.433e-03 -1.798e-01  0.188963
## 3421   4.900e-01 -5.102e-02  6.195e-03  0.630736
## 3431   2.786e-01 -7.558e-03 -1.220e-01 -0.428720
## 3441   3.186e-01  4.198e-01 -8.067e-02 -0.051440
## 3451   1.840e-01 -1.662e-01 -1.730e-01 -0.217194
## 3461   2.089e-01 -1.729e-01 -1.560e-01 -0.685965
## 3471   1.156e-01 -1.866e-01  9.760e-02 -0.251759
## 3481   1.221e-01 -1.689e-01 -6.823e-02 -0.282804
## 3491   1.694e-01  1.010e-02 -1.288e-01 -0.182235
## 3501   2.630e-01 -3.518e-03 -1.389e-01 -0.506426
## 3515   9.422e-02 -1.562e-01 -1.249e-01  0.608720
## 3521  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 3531   2.863e-01  1.512e-01 -1.189e-01 -0.342701
## 3541   2.535e-01  5.531e-01 -9.293e-02  0.162240
## 3551   2.537e-01  2.663e-01  1.767e-01 -0.869891
## 3561   2.440e-01  9.295e-03 -2.205e-01 -0.183821
## 3571   2.938e-01  1.303e-01  5.647e-02 -0.365835
## 3581   1.346e-01  5.396e-03 -4.338e-02 -0.285488
## 3591   1.235e-01 -1.751e-01 -1.759e-02 -0.399631
## 3601   1.656e-01 -3.815e-01 -4.658e-02 -0.585615
## 3615   3.995e-01  1.401e-01 -1.543e-01  0.373619
## 3621   2.786e-01 -1.836e-01 -1.432e-01 -0.210326
## 3631  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 3641  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 3651  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 3661  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 3671  -1.116e-01 -5.740e-01 -3.887e-02 -0.084959
## 3681  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 3691  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 3701  -2.635e-01  1.945e-01  2.263e-01 -0.264044
## 3715   3.107e-01 -6.062e-03 -1.718e-01 -0.152516
## 3721   2.584e-01  1.350e-01  5.986e-02 -0.435956
## 3731   2.505e-01 -1.778e-01 -1.637e-01 -0.503742
## 3741   1.698e-01 -3.638e-01 -2.011e-01 -0.214151
## 3751   3.017e-01 -1.253e-02 -1.072e-01 -0.363926
## 3761   3.230e-01  2.951e-01 -1.499e-01  0.096661
## 3771   3.717e-01 -1.890e-01 -2.171e-01 -0.132821
## 3781   2.236e-01 -1.672e-01 -2.094e-01  0.086665
## 3791   3.510e-01  4.194e-01 -1.233e-01 -0.204939
## 3801   1.680e-01 -4.441e-02  3.479e-01 -0.569963
## 3815   2.593e-01  4.128e-01  6.062e-02 -0.013939
## 3821   3.107e-01 -6.062e-03 -1.718e-01 -0.152516
## 3831   8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 3841  -5.751e-02  1.820e-01  6.892e-02 -0.096599
## 3851  -8.935e-02 -3.233e-01 -2.107e-01  0.095532
## 3861  -1.304e-03 -1.233e-03  2.070e-01  0.267611
## 3871   1.834e-01  2.871e-01  9.803e-02 -0.278173
```

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## 3881   4.208e-01  1.375e-01 -1.695e-01 -0.088623
## 3891   4.294e-01  7.403e-01 -6.193e-02 -0.039576
## 3901   4.337e-01  5.129e-01  1.800e-02 -0.179131
## 3915   2.965e-01 -1.208e-02 -1.038e-01 -0.342803
## 3921   2.255e-01 -9.428e-03 -1.979e-02  0.292683
## 3931   3.375e-01  1.395e-01 -8.153e-02 -0.287220
## 3941   2.365e-01  2.990e-01 -7.983e-02 -0.363126
## 3951   2.667e-02 -1.664e-01  3.600e-02 -0.264194
## 3961   2.225e-01  1.689e-01 -1.862e-01 -0.124318
## 3971   2.687e-01  1.373e-01  2.089e-02 -0.675475
## 3981   2.874e-01 -1.802e-01 -1.827e-01 -0.099058
## 3991   4.071e-01 -2.003e-01 -1.618e-01 -0.023298
## 4001   2.047e-01  5.202e-01  2.468e-01 -0.585231
## 4015   1.061e-01  1.820e-01 -1.439e-01  0.098533
## 4021   6.516e-02 -3.564e-01 -1.256e-01 -0.102984
## 4031   2.065e-01 -1.678e-01 -1.889e-01 -0.253450
## 4041   3.266e-01  2.624e-01  1.238e-01 -0.466861
## 4051   1.694e-01  1.010e-02 -1.288e-01 -0.182235
## 4061   1.177e-01  1.213e-01  3.643e-01 -0.602372
## 4071   1.775e-01  1.548e-01 -8.375e-03 -0.416702
## 4081   1.411e-01  2.063e-02 -1.801e-01  0.032031
## 4091  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 4105  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 4115   1.471e-01  5.719e-01 -1.260e-01 -0.164515
## 4121  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 4131  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 4151  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 4171  -2.872e-01 -1.357e-01  1.793e-01 -0.258959
## 4181  -2.793e-02 -3.731e-01  1.540e-01  0.273338
## 4191  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 4201  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 4215  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 4221  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 4231  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 4241  -3.013e-01 -3.333e-01  1.511e-01 -0.255916
## 4251   2.206e-01 -4.049e-01  9.804e-02 -0.142926
## 4261   2.173e-01 -3.390e-03 -7.322e-02 -0.210891
## 4271   3.358e-01 -1.421e-03 -2.498e-01 -0.318650
## 4281   1.930e-01  3.095e-03 -1.013e-01 -0.332783
## 4291   1.938e-01 -3.419e-03 -4.105e-02 -0.171707
## 4301   1.671e-01 -3.753e-01 -9.408e-02 -0.165980
## 4315   9.179e-02  1.551e-02 -7.262e-02 -0.108711
## 4321   3.775e-01  2.888e-01 -1.676e-01  0.024868
## 4331   2.138e-01  1.696e-01 -1.805e-01 -0.089103
## 4341   2.144e-01  5.609e-01 -1.146e-01 -0.038817
## 4351   4.173e-01  9.261e-01  1.033e-02  0.775014
## 4361   2.525e-01 -1.818e-01 -1.293e-01 -0.400882
## 4371   3.007e-01 -1.884e-01 -1.359e-01 -0.468905
## 4381  -1.097e-01  9.754e-01  1.026e+00  0.126625
## 4391   1.805e-01  7.953e-03 -1.306e-01 -0.466899
## 4401   1.774e-01 -1.829e-01 -1.759e-02 -0.295218
## 4415   2.417e-01 -1.688e-01 -2.213e-01  0.013414
```

```
## 4421  -5.221e-01 -4.864e-01 -2.697e-01  0.023988
## 4431  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 4441  -2.872e-01 -1.357e-01  1.793e-01 -0.258959
## 4451  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 4461  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 4471  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 4481  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 4491  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 4501  -2.872e-01 -1.357e-01  1.793e-01 -0.258959
## 4515  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 4521   3.403e-01 -1.946e-01 -1.234e-01 -0.021418
## 4531   2.667e-01 -1.755e-01 -2.043e-01 -0.455358
## 4541   2.258e-01  7.951e-03 -1.779e-01  0.125329
## 4551   2.048e-01 -1.777e-01 -9.807e-02 -0.208207
## 4561   5.556e-01 -9.923e-02  3.328e-01 -0.023274
## 4571   2.622e-01  1.562e-01 -1.325e-01 -0.412006
## 4581   3.164e-01 -6.551e-03 -1.756e-01 -0.175701
## 4591   3.139e-01 -1.907e-01 -1.286e-01 -0.282135
## 4601   3.167e-01 -1.925e-01 -1.192e-01 -0.393991
## 4615   2.018e-01 -1.964e-01  7.015e-02 -0.284690
## 4621   2.787e-01 -1.757e-01 -2.047e-01  0.191647
## 4631   3.453e-01  1.421e-01 -1.130e-01 -0.194936
## 4641   2.245e-01  1.584e-03 -1.240e-01 -0.077254
## 4651   5.721e-01 -2.710e-01  2.663e-01  0.861583
## 4661  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 4671   2.757e-01 -2.493e-02  4.913e-02  0.196978
## 4681   2.604e-01 -6.436e-03 -9.682e-02  0.094510
## 4691   2.574e-01 -1.701e-01 -2.315e-01 -0.050040
## 4701   1.624e-01  9.672e-01 -3.197e-02  0.086441
## 4715   2.912e-01  3.011e-01 -1.644e-01 -0.057296
## 4721   1.791e-01 -1.758e-01 -8.549e-02 -0.427567
## 4731   3.575e-01 -1.074e-02 -1.932e-01 -0.186778
## 4741   2.863e-01  5.133e-01  1.935e-01 -0.914610
## 4761   1.372e-01  4.438e-01 -3.930e-02  0.599480
## 4771   4.911e-01  2.652e-01 -1.029e-01  0.304804
## 4781   3.366e-01  8.265e-01  1.705e-01  0.183866
## 4791   4.014e-01  2.752e-01 -5.477e-02  1.130717
## 4801   2.271e-01  4.286e-01 -4.753e-02 -0.541132
## 4815   1.594e-01  4.207e-01  1.216e-01 -0.099239
## 4821   3.152e-01  5.401e-01 -7.483e-02 -0.534163
## 4831   2.111e-01  4.044e-01  2.026e-01  0.131340
## 4841   2.653e-01  2.977e-01 -1.015e-01 -0.133946
## 4851  -1.097e-01  9.754e-01  1.026e+00  0.126625
## 4861   1.141e-01  4.288e-01  1.154e-01  0.191284
## 4871  -4.978e-02  7.054e-01 -4.227e-02  0.216442
## 4881  -5.751e-02  1.820e-01  6.892e-02 -0.096599
## 4891   2.590e-01 -4.821e-03 -9.201e-02  0.898074
## 4901  -1.364e-01  6.035e-01  9.730e-01  0.132352
## 4915   1.972e-01  4.299e-01 -1.502e-02 -0.314417
## 4921  -1.720e-01  1.056e-01  9.021e-01  0.140019
## 4931  -1.282e-01 -4.291e-01  7.734e-01 -0.181232
## 4941   2.862e-01  1.499e-01 -9.930e-02  0.017316
```

```
## 4951   3.381e-01 -3.770e-03 -2.283e-01 -0.145717
## 4961   3.146e-01  1.357e-01 -2.006e-03  0.443390
## 4971   1.411e-01  2.063e-02 -1.801e-01  0.032031
## 4981   3.062e-01  4.008e-01  1.098e-01  0.190422
## 4991  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 5001   4.037e-01 -2.260e-02 -1.412e-01  0.179308
## 5015   1.357e-01  3.563e-03 -1.987e-02  0.118489
## 5021  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 5031   2.568e-01 -1.756e-01 -1.720e-01  0.433732
## 5041   4.079e-01 -2.062e-01 -1.058e-01  0.189216
## 5051  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 5061   2.847e-01 -2.175e-02  2.409e-03 -0.111818
## 5071   4.799e-01 -5.033e-02  7.663e-03  0.363046
## 5081  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 5091  -2.872e-01 -1.357e-01  1.793e-01 -0.258959
## 5105   2.573e-01  3.040e-01 -1.422e-01  0.079409
## 5115   1.964e-01  8.146e-03 -1.481e-01 -0.219878
## 5121   2.804e-01  1.546e-01 -1.249e-01  0.428647
## 5131  -1.527e-01  3.754e-01  9.405e-01  0.135865
## 5141  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 5151  -4.487e-01  5.393e-01 -1.234e-01  0.008192
## 5161  -8.116e-02 -1.483e-01  2.184e-02 -0.091514
## 5171   3.915e-02  7.931e-03  6.086e-02 -0.266878
## 5181   2.989e-01 -1.034e-02 -1.266e-01 -0.540271
## 5191   2.174e-01 -3.793e-01 -1.177e-01  0.189054
## 5201  -2.747e-01  3.862e-02  2.041e-01 -0.261643
## 5215   1.411e-01  2.063e-02 -1.801e-01  0.032031
## 5221   1.800e-01  5.648e-01 -1.025e-01  0.023651
## 5231   2.072e-01 -1.921e-01  2.715e-02 -0.157857
## 5241   3.046e-01  7.253e-01  2.446e-01  0.362051
## 5251  -5.763e-02  5.957e-01 -5.791e-02  0.218130
## 5261   4.551e-02  6.526e-01  3.002e-01  0.257543
## 5271   1.746e-01  5.477e-01  5.772e-02  0.110109
## 5281  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 5291  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 5301   8.357e-02  3.117e-03  5.468e-02  0.197840
## 5315  -8.543e-02  2.074e-01 -1.133e-01  0.224109
## 5321   2.410e-01  1.447e-01 -2.799e-03 -0.443475
## 5331   3.966e-02  4.086e-01  3.872e-01 -0.067172
## 5341  -4.402e-01  6.578e-01 -1.065e-01  0.006368
## 5351  -1.291e-01  7.056e-01  9.876e-01  0.130780
## 5361  -4.487e-01  5.393e-01 -1.234e-01  0.008192
## 5381   2.625e-01 -1.803e-01 -1.464e-01  0.022401
## 5391   3.935e-01  2.677e-01  1.074e-02  0.577772
## 5401  -4.487e-01  5.393e-01 -1.234e-01  0.008192
## 5415  -4.323e-01  7.674e-01 -9.088e-02  0.004680
## 5421   4.530e-01  2.763e-01 -1.504e-01  0.309235
## 5431   3.576e-01 -1.489e-02 -1.613e-01 -0.411667
## 5441  -7.533e-02  3.485e-01 -9.316e-02  0.221937
## 5461   2.022e-01  1.637e-01 -1.185e-01 -0.369992
## 5471   2.969e-01  2.720e-01  9.147e-02  0.192405
## 5481  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
```

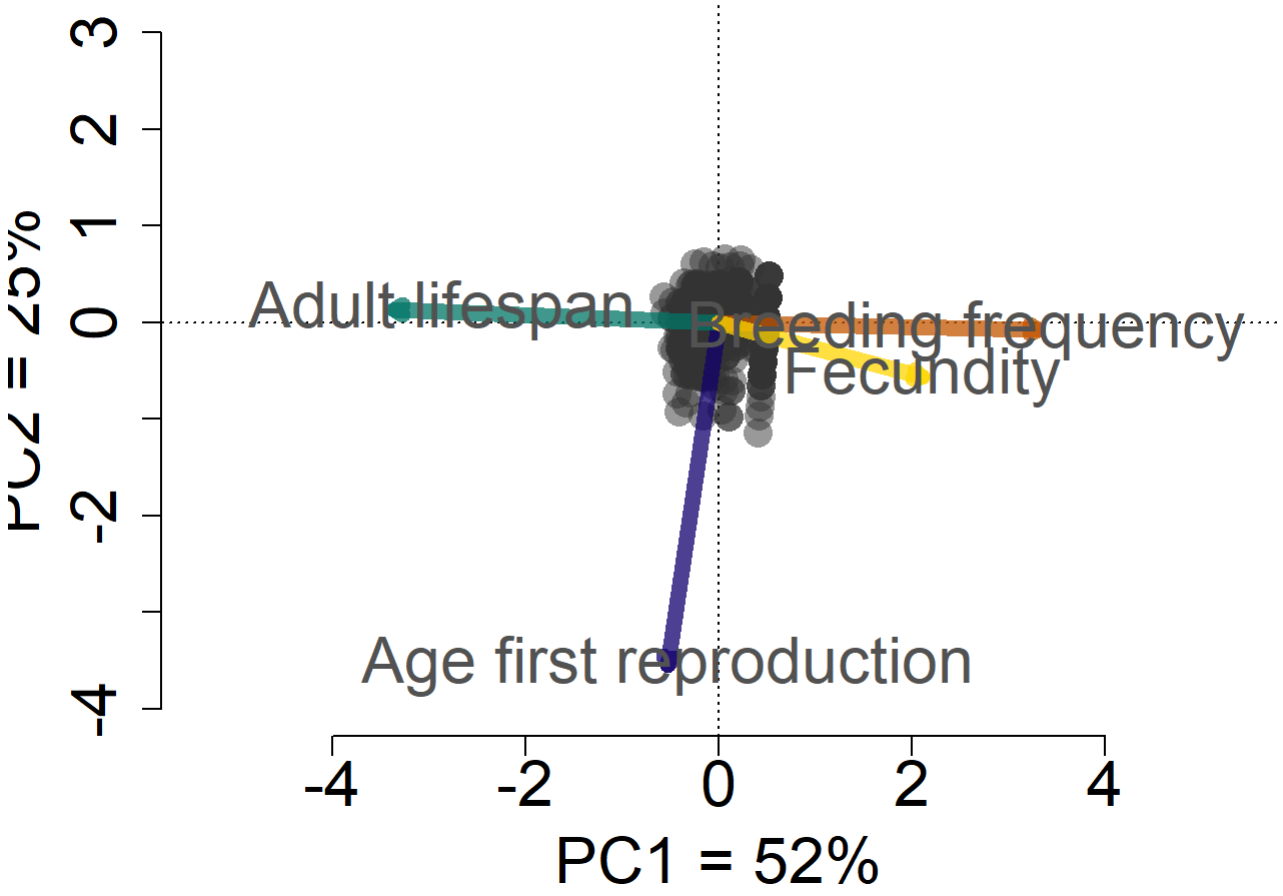
```
## 5491   3.948e-01  1.318e-01 -8.996e-02 -0.336689
## 5501   2.049e-01  1.525e-01 -1.882e-02 -0.174108
## 5515   2.590e-01 -4.821e-03 -9.201e-02  0.898074
## 5521   2.371e-01  5.190e-04 -1.445e-01 -0.697192
## 5531  -1.767e-01  6.704e-03  3.537e-01 -0.432623
## 5541   9.179e-02  1.551e-02 -7.262e-02 -0.108711
## 5551   1.808e-01  1.283e-01  2.295e-01 -0.077529
## 5561   2.245e-01  1.584e-03 -1.240e-01 -0.077254
## 5571   2.844e-01 -1.249e-02 -8.349e-02 -0.310652
## 5581   2.871e-01  1.308e-01  6.311e-02 -0.233939
## 5591   3.483e-01  1.232e-01  6.209e-02  0.317791
## 5601   6.897e-02  5.638e-01  5.046e-02 -0.091843
## 5615   2.653e-01  2.895e-01 -2.228e-02  0.178755
## 5621   1.698e-01 -3.638e-01 -2.011e-01 -0.214151
## 5631   1.091e-01 -2.436e-01  6.237e-01  0.323284
## 5641   1.280e-01 -1.225e-02  1.225e-01 -0.254443
## 5651  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 5661   2.130e-01 -1.837e-01 -4.465e-02  0.295367
## 5671  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 5681   1.232e-01 -1.707e-01 -4.473e-02  0.121173
## 5691   2.472e-01  1.630e-01 -1.623e-01  0.081580
## 5701   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 5715  -3.563e-02  9.030e-01 -1.410e-02  0.213399
## 5721  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 5731   2.655e-02  3.469e-02 -1.503e-01  0.173244
## 5741   2.785e-01 -3.989e-01 -1.526e-02  0.640447
## 5751   2.069e-01 -1.582e-02  5.649e-02  0.060424
## 5761   2.047e-01 -1.382e-02  4.958e-02  0.435056
## 5771   1.753e-02 -1.546e-01 -5.198e-02 -0.080779
## 5781   1.357e-01  1.248e-02 -1.046e-01 -0.144248
## 5791  -3.301e-03 -1.914e-01  3.017e-01 -0.057932
## 5801   2.255e-01 -9.428e-03 -1.979e-02  0.292683
## 5815   2.552e-01  1.567e-01 -1.217e-01 -0.131774
## 5821   3.146e-01  1.357e-01 -2.006e-03  0.443390
## 5831  -4.057e-01  1.139e+00 -3.785e-02 -0.001047
## 5841  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 5851   1.463e-01  2.288e-02 -2.118e-01 -0.192194
## 5861  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 5871  -9.788e-02  4.032e-02 -4.620e-02 -0.323580
## 5881   1.609e-01 -1.657e-01 -1.508e-01 -0.435406
## 5891   3.091e-01 -1.871e-01 -1.456e-01  0.112487
## 5901  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 5915  -1.619e-01  2.467e-01  9.222e-01  0.137848
## 5921  -5.751e-02  1.820e-01  6.892e-02 -0.096599
## 5931   1.544e-01  1.403e-02 -1.312e-01  0.413361
## 5941  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 5951  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 5961   1.067e-01  1.810e-02 -1.000e-01  0.606036
## 5971  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 5981   8.138e-02 -1.676e-01 -2.526e-02 -0.266502
## 5991  -1.720e-01  1.056e-01  9.021e-01  0.140019
## 6001  -1.291e-01  7.056e-01  9.876e-01  0.130780
```

```
## 6015  -9.659e-02  5.153e-02 -1.355e-01  0.226510
## 6021  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 6031   6.516e-02 -3.564e-01 -1.256e-01 -0.102984
## 6041   1.938e-01 -3.419e-03 -4.105e-02 -0.171707
## 6051   1.280e-01 -1.225e-02  1.225e-01 -0.254443
## 6061  -1.232e-01 -3.204e-01 -1.885e-01  0.232237
## 6071   1.386e-01  4.535e-01 -1.429e-01 -0.162691
## 6081   2.750e-01 -6.004e-03 -1.215e-01  0.019717
## 6091  -9.530e-02 -3.459e-01 -6.341e-03 -0.088472
## 6105   1.502e-01  2.919e-01  1.033e-01 -0.097257
## 6114  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 6121   2.395e-01 -4.039e-01  7.347e-02  0.315965
## 6131   1.232e-01 -1.707e-01 -4.473e-02  0.121173
## 6141   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 6151  -4.086e-02  8.748e-03  1.588e-01 -0.298984
## 6161   1.508e-01 -1.941e-01  1.128e-01 -0.488100
## 6171   4.117e-02  1.756e-01 -4.897e-03 -0.085864
## 6181  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 6191  -1.304e-03 -1.233e-03  2.070e-01  0.267611
## 6201   2.402e-01  3.035e-01 -1.217e-01 -0.260707
## 6214  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 6221  -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 6231   2.718e-02  9.690e-03  5.536e-02 -0.535403
## 6241  -1.720e-01  1.056e-01  9.021e-01  0.140019
## 6251  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 6261   1.391e-01 -3.638e-01 -1.689e-01 -0.625483
## 6271  -1.619e-01  2.467e-01  9.222e-01  0.137848
## 6281   3.123e-01 -2.156e-01  1.197e-01  0.929151
## 6291  -1.832e-01 -5.030e-02  8.798e-01  0.142420
## 6301  -3.864e-01  2.626e-01 -2.152e-01 -0.317033
## 6314  -2.747e-01  3.862e-02  2.041e-01 -0.261643
## 6321  -3.645e-02  4.640e-02 -1.748e-01 -0.016231
## 6331   7.109e-02 -1.712e-01  2.983e-02  0.200524
## 6341  -1.655e-01  1.626e-01  3.759e-01 -0.435024
## 6351   6.221e-02  2.420e-02 -1.142e-01 -0.282836
## 6361   1.179e-01  1.740e-01 -7.777e-02  0.603635
## 6371  -7.533e-02  3.485e-01 -9.316e-02  0.221937
## 6381   1.866e-01  1.726e-01 -1.700e-01 -0.032839
## 6391  -1.378e-02 -1.755e-01  1.822e-01  0.270295
## 6401   1.758e-01 -1.632e-01 -1.782e-01  0.279340
## 6414   1.846e-01 -2.501e-02  1.798e-01  0.639618
## 6421  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 6431  -4.579e-01  4.106e-01 -1.418e-01  0.010175
## 6441   9.860e-03  1.547e-01  2.292e-01  0.265210
## 6451  -1.345e-01  6.249e-02 -1.899e-01 -0.122592
## 6461   1.249e-02 -2.020e-01  3.705e-01 -0.267907
## 6471  -1.957e-01 -2.246e-01  8.550e-01  0.145104
## 6481   1.091e-01 -2.436e-01  6.237e-01  0.323284
## 6491  -1.304e-03 -1.233e-03  2.070e-01  0.267611
## 6501  -8.543e-02  2.074e-01 -1.133e-01  0.224109
## 6513   3.579e-01  1.320e-01 -3.031e-02  0.268649
## 6521   2.146e-01 -5.251e-02  3.690e-01 -0.055722
```

```
## 6531   1.652e-01 -3.283e-02  2.560e-01 -0.238416
## 6551   2.559e-01  4.163e-01  4.091e-02  0.286127
## 6561   1.661e-01  4.293e-01  4.083e-02  0.111933
## 6571   3.692e-01  3.980e-01  5.162e-02  0.202894
## 6581   1.808e-01  1.283e-01  2.295e-01 -0.077529
## 6591   1.758e-01 -1.632e-01 -1.782e-01  0.279340
## 6601   2.400e-01  1.430e-01  2.215e-02 -0.009785
## 6613   1.067e-01  1.810e-02 -1.000e-01  0.606036
## 6621   4.028e-01  2.617e-01  3.396e-02 -0.222429
## 6631  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 6641   4.080e-02 -3.539e-02  4.393e-01 -0.422540
## 6651  -4.680e-01  2.695e-01 -1.619e-01  0.012347
## 6661  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 6671   1.694e-01  1.010e-02 -1.288e-01 -0.182235
## 6681   3.166e-01 -1.519e-02 -9.763e-02 -0.094518
## 6691   3.652e-01 -2.434e-02 -6.973e-02  0.420544
## 6701   3.044e-02  2.799e-01  3.689e-01 -0.065189
## 6713  -8.116e-02 -1.483e-01  2.184e-02 -0.091514
## 6721  -5.058e-01 -2.583e-01 -2.371e-01  0.020475
## 6731   2.047e-01 -1.382e-02  4.958e-02  0.435056
## 6741  -8.543e-02  2.074e-01 -1.133e-01  0.224109
## 6751   1.789e-01 -1.800e-01 -4.988e-02 -0.512950
## 6761  -1.091e-01 -1.228e-01 -1.604e-01  0.229194
## 6771  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 6781   8.248e-02 -1.482e-01 -1.910e-01  0.103618
## 6791   2.912e-01 -1.433e-03 -1.798e-01  0.188963
## 6801  -4.792e-01  1.136e-01 -1.841e-01  0.014748
## 6813   1.270e-01  1.624e-01 -1.088e-02 -0.513672
## 6821  -7.533e-02  3.485e-01 -9.316e-02  0.221937
## 6831  -4.916e-01 -6.070e-02 -2.090e-01  0.017432
## 6841   4.803e-01 -2.196e-01 -8.160e-02  0.232821
## 6851  -5.751e-02  1.820e-01  6.892e-02 -0.096599
## 6861  -2.098e-01 -4.222e-01  8.268e-01  0.148147
## 6871   1.857e-01  1.584e-02 -1.989e-01 -0.071785
## 6881   1.606e-01  1.226e-01  3.135e-01  0.223832
## 6891   1.407e-02 -1.396e-01 -1.751e-01  0.175928
## 6901   1.488e-01 -3.552e-01 -2.452e-01 -0.024711
## 6913   3.292e-01 -1.194e-02 -1.402e-01  0.034333
## 6921  -4.250e-01  8.695e-01 -7.632e-02  0.003107
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_WA1_reverse <- test.pca_WA1
test.pca_WA1_reverse$CA$u <- -(test.pca_WA1_reverse$CA$u)
test.pca_WA1_reverse$CA$v <- -(test.pca_WA1_reverse$CA$v)
g <- vegan::scores(test.pca_WA1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_WA1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-4,3), xlim=c(-3.5,
3.5), main="", xlab="PC1 = 52%", ylab="PC2 = 25%", cex.axis=2, cex.lab=2)
with(data_WA, points(test.pca_WA1_reverse, display = "sites", col = col_points, scaling = scl, p
ch = 16, cex=2))
g <- vegan::scores(test.pca_WA1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1]+0.5, y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1]-0.75, y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```



```r
# Test for proportion of variance explained per axe
sum_all_WA <- summary(test.pca_WA1)

prop_WA <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_WA[j,i+1] <- as.numeric(abs(sum_all_WA$species[i,j])/sum(abs(sum_all_WA$species[i,])))
  }
}

prop_WA
```

```
##   PC        prim      adult      breed       freq
## 1  1 0.118024472 0.62816690 0.61018610 0.37558789
## 2  2 0.790849517 0.02568004 0.01324922 0.09977922
## 3  3 0.089221100 0.15587848 0.19373423 0.51247499
## 4  4 0.001904911 0.19027458 0.18283045 0.01215791
```

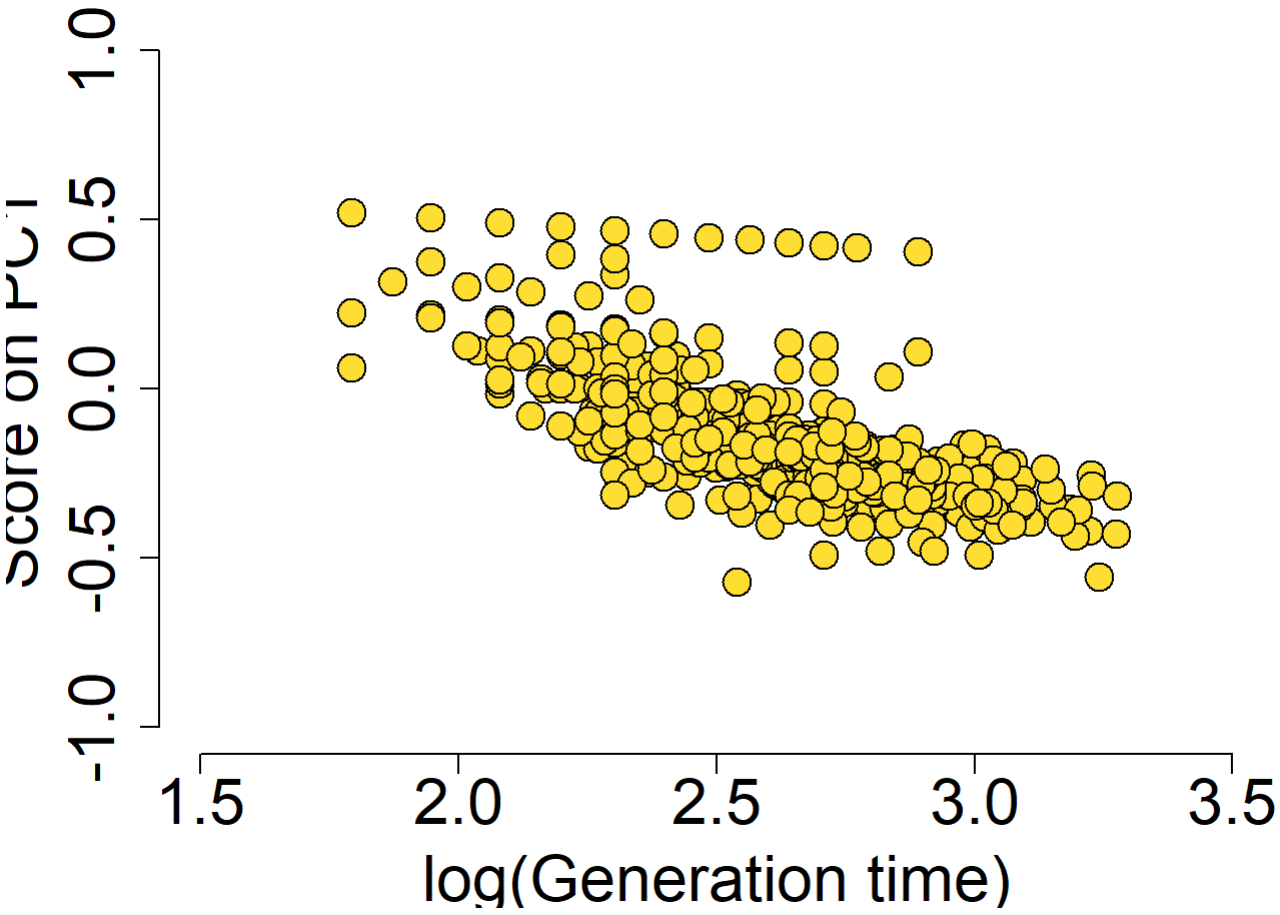
```r
# Covariances
test <- as.matrix(scale(log(data_WA[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq     fec_one
## age_first_repro      1.00000000     0.07416693 -0.08194516 -0.02148279
## lifetime_adult       0.07416693     1.00000000 -0.84314440 -0.35990610
## breed_freq          -0.08194516    -0.84314440  1.00000000  0.31150143
## fec_one             -0.02148279    -0.35990610  0.31150143  1.00000000
```

```r
# Correlation with generation time
individual_score_WA_reverse <- as.numeric(vegan::scores(test.pca_WA1_reverse)$sites[,1])
summary(lm(individual_score_WA_reverse ~ log(data_WA$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_WA_reverse ~ log(data_WA$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.52226 -0.12872 -0.03793  0.08400  0.68963
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                    1.64152    0.05544   29.61   <2e-16 ***
## log(data_WA$generation_time) -0.66615    0.02232  -29.85   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1823 on 678 degrees of freedom
## Multiple R-squared:  0.5679, Adjusted R-squared:  0.5672
## F-statistic:   891 on 1 and 678 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_WA$generation_time), individual_score_WA_reverse, pch=21, xlab="log(Generation tim
e)", ylab="Score on PC1", xlim=c(1.5,3.5), ylim=c(-1,1), bg=colors[15], cex=2, cex.axis=2, cex.l
ab=2)
```



Black-browed albatross

```
data_bbalbatross <- data[which(data$species == "blackbrowedalbatross"),]
data_bbalbatross$fec_one <- data_bbalbatross$fecundity +  1
test.pca_bbalbatross1 <- rda(log(data_bbalbatross[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_bbalbatross1)
```

```
##
## Call:
## rda(X = log(data_bbalbatross[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3     PC4
## Eigenvalue            1.5869 1.1718 0.8787 0.36265
## Proportion Explained  0.3967 0.2929 0.2197 0.09066
## Cumulative Proportion 0.3967 0.6897 0.9093 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  5.208581
##
##
## Species scores
##
##                      PC1     PC2     PC3     PC4
## age_first_repro   0.5545  1.7262 -1.8582 -0.2048
## lifetime_adult    2.3146 -0.1954  0.5275 -1.0530
## breed_freq       -2.1204  0.9693  0.5914 -0.9985
## fec_one           0.7761  1.9975  1.3705  0.5585
##
##
## Site scores (weighted sums of species scores)
##
##              PC1       PC2       PC3       PC4
## 1337   0.475739  0.049126  0.361610 -0.201288
## 2130  -0.135435  1.183096 -0.880124  0.258500
## 3127   0.556709 -0.281721 -0.445510 -0.273977
## 4128  -0.115454  0.546472  0.075002  0.163823
## 5126   0.305474  0.085496 -0.150722 -0.533831
## 6126   0.627702 -0.173092 -0.116525  0.127833
## 7122   0.641591 -0.346867 -0.348918  0.809397
## 8122  -0.438919  0.048658 -0.878795 -0.197458
## 9120  -0.121239  0.138539  0.256704 -0.112251
## 10120 -0.531464 -0.341482 -0.318721 -0.047912
## 11118  0.774419 -0.594753 -0.192934  0.212005
## 12107 -0.364984 -0.360512 -0.250196 -0.379320
## 1338  -0.359421  0.383800 -1.359916 -0.325921
## 1429   0.023502  0.201378  0.377536 -0.287043
## 1530   0.187539 -0.378380  0.186516 -0.107979
## 1629   0.113270  0.223353  0.439360 -0.419717
## 1730   0.003684  0.627048 -0.016566 -0.065191
```

```
## 1830   0.472828 -0.001308  0.029787 -0.171179
## 1928   0.263959  0.282570  0.560369 -0.610553
## 2028   0.124362  0.414931  0.329148 -0.322586
## 2136   1.137365 -0.148428 -0.672209  0.535114
## 2228   0.446018  0.552031 -0.113155 -0.505482
## 2328   0.072124  0.232839  0.162534 -0.487100
## 2427   0.684620  0.020037 -0.341018 -0.393882
## 2527   0.322428  0.127039  0.125585 -0.365848
## 2625   0.348332  0.235249  0.211277 -0.161122
## 2725  -0.240320  0.740933 -0.245367  0.427987
## 2825  -0.181904 -0.095174  0.344870 -0.158070
## 2925  -0.240320  0.740933 -0.245367  0.427987
## 3025   0.677214  0.011856  0.111294 -0.246349
## 3128   0.455644  0.033099 -0.140925 -0.657753
## 3225   0.491377  0.173535 -0.227992 -0.648881
## 3325  -0.221928  0.157774 -0.042359 -0.056900
## 3425  -0.332864  0.350793  0.314707  0.577532
## 3525   0.562013 -0.172472 -0.825977  0.169730
## 3624   0.226338 -0.004104  0.619187 -0.774100
## 3724   0.271930  0.639990 -0.246345 -0.758352
## 3825   0.300792 -0.117276  0.219656 -0.789597
## 3924   0.570342 -0.414907  0.230619  0.220524
## 4025  -0.115454  0.546472  0.075002  0.163823
## 4129  -0.281933  0.565503  0.006476  0.495231
## 4225   0.328564  0.166343  0.148228 -0.223376
## 4325   0.041813  0.787788 -0.247320 -0.126804
## 4425  -0.504581 -0.228151 -0.481416 -0.091354
## 4525   0.316473  0.147320 -0.122352 -0.240345
## 4624   0.324448  0.174156 -0.330182 -0.168403
## 4724   0.362221  0.061475 -0.021117  0.520443
## 4824   0.360191  0.282866 -0.015147  0.047820
## 4924   0.241206 -0.228973  0.001930  0.083182
## 5024   0.072549  0.214698  0.412328 -0.357658
## 5127  -0.332864  0.350793  0.314707  0.577532
## 5224  -0.221928  0.157774 -0.042359 -0.056900
## 5324   0.401149 -0.194801  0.162891 -0.656232
## 5424   0.568830  0.418618 -0.226651 -0.267628
## 5524   0.573128  0.245238 -0.417694  0.016061
## 5624   0.600272 -0.039109 -0.703950  0.290218
## 5724   0.386452 -0.322018  0.002733 -0.315096
## 5824   0.054380  0.569509 -0.230343 -0.355318
## 5924  -0.338101 -0.247181 -0.412891 -0.422761
## 6024   0.391053  0.249427  0.280090 -0.550345
## 6127   0.452184 -0.603237 -0.569468  0.136739
## 6223  -0.458779 -0.035065 -0.758605 -0.165366
## 6323  -0.042117  0.433962  0.260623  0.008822
## 6423   0.090336  0.143411  0.366213 -0.491942
## 6520   0.275777 -0.055199  0.225232 -0.384660
## 6620  -0.176126  0.350860 -0.319548 -0.130912
## 6720  -0.638738 -0.793721  0.330501  0.125436
## 6820   0.322428  0.127039  0.125585 -0.365848
## 6920   0.573662 -0.240179 -0.169203 -0.105994
```

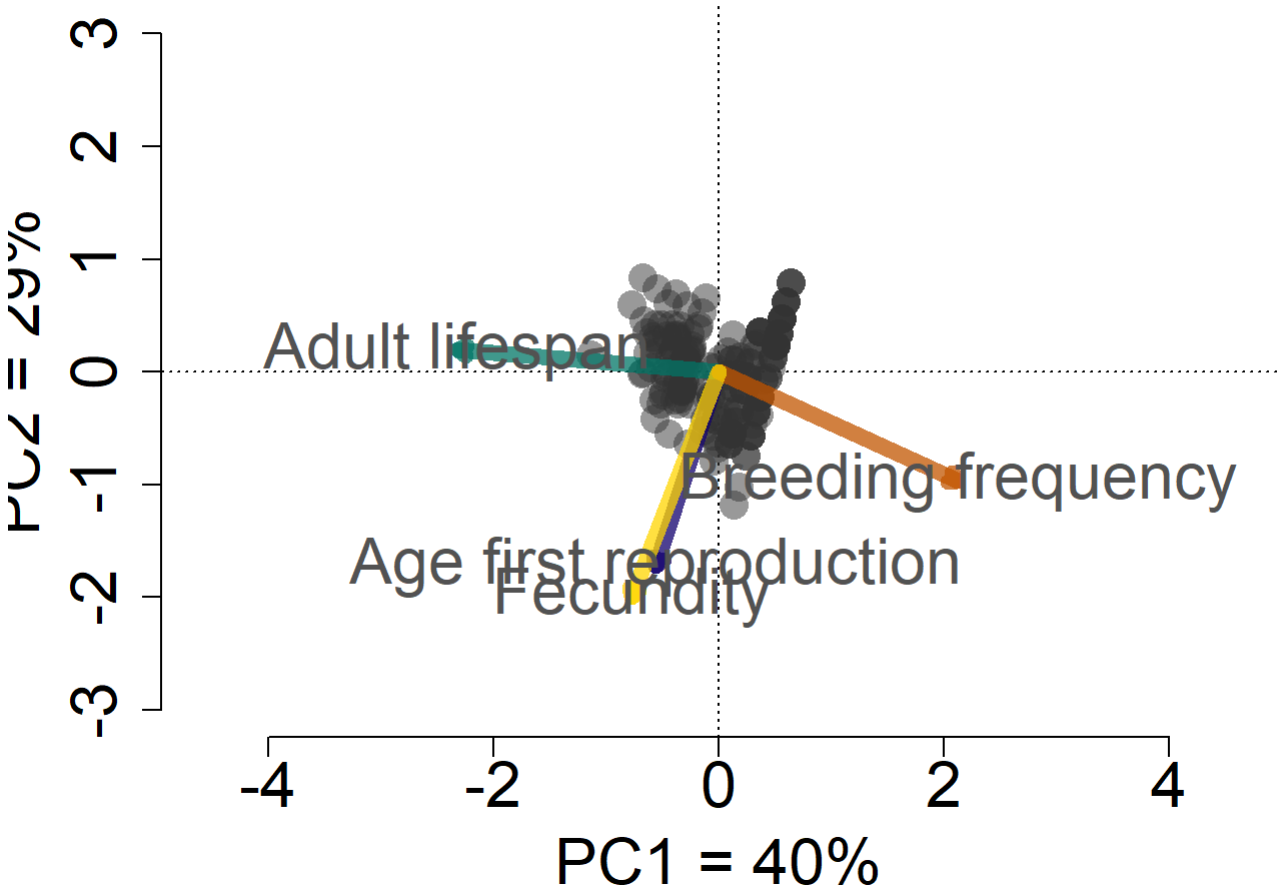
```
## 7019  -0.221928  0.157774 -0.042359 -0.056900
## 7123  -0.070308  0.353248 -0.051527 -0.194551
## 7219  -0.082331  0.025412  0.188862 -0.344867
## 7319   0.245299 -0.183683  0.409680 -0.335411
## 7419  -0.305981  0.464125  0.152012  0.534091
## 7519  -0.332864  0.350793  0.314707  0.577532
## 7619  -0.281933  0.565503  0.006476  0.495231
## 7719  -0.123149 -0.332061  0.191452 -0.603655
## 7819  -0.082331  0.025412  0.188862 -0.344867
## 7919  -0.332864  0.350793  0.314707  0.577532
## 8019  -0.115454  0.546472  0.075002  0.163823
## 8123  -0.139501  0.445094  0.220538  0.202683
## 8218   0.586701 -0.316013 -0.247296 -0.001291
## 8319   0.335338 -0.051856  0.141578  0.563884
## 8419   0.235064 -0.195874  0.370327 -0.108794
## 8518  -0.281933  0.565503  0.006476  0.495231
## 8619   0.669431 -0.458287 -0.129525  0.502647
## 8718  -0.364984 -0.360512 -0.250196 -0.379320
## 8819  -0.363341  0.222309  0.499156  0.626782
## 8919  -0.093700  0.638180 -0.056651  0.128671
## 9019  -0.112809 -0.103072  0.373310 -0.295617
## 9122  -0.221928  0.157774 -0.042359 -0.056900
## 9218   0.279465 -0.095609  0.123957  0.203671
## 9318  -0.480533 -0.126772 -0.626952 -0.130213
## 9417  -0.480533 -0.126772 -0.626952 -0.130213
## 9517  -0.638738 -0.793721  0.330501  0.125436
## 9617   0.508180 -0.421546  0.241533 -0.102805
## 9718  -0.561941 -0.469966 -0.134273  0.001337
## 9818  -0.166384  0.331763  0.383233  0.246124
## 9918  -0.363341  0.222309  0.499156  0.626782
## 10018  0.374092 -0.327747  0.007478 -0.439920
## 10122  0.281924 -0.140797 -0.145389 -0.274372
## 10218 -0.638738 -0.793721  0.330501  0.125436
## 10318  0.368131 -0.296887 -0.375097  0.727730
## 10418 -0.248811  0.044443  0.120336 -0.013459
## 10518 -0.561941 -0.469966 -0.134273  0.001337
## 10618 -0.504581 -0.228151 -0.481416 -0.091354
## 10718 -0.174658  1.017742 -0.642746  0.321883
## 10818  0.434569 -0.134672 -0.092239 -0.291667
## 10917 -0.232045  0.054954  0.780612  0.352228
## 11017 -0.078982 -0.178105  0.332322 -0.464561
## 11119 -0.279288 -0.084042  0.304785  0.035791
## 11217  0.374186  0.114095 -0.166249  0.034198
## 11316  0.341248 -0.410218 -0.212401  0.771171
## 11417 -0.139501  0.445094  0.220538  0.202683
## 11517 -0.279288 -0.084042  0.304785  0.035791
## 11617  0.260693 -0.334297  0.185157  0.474039
## 11717  0.328564  0.166343  0.148228 -0.223376
## 11817  0.309017 -0.015322  0.586781 -0.350712
## 11917  0.461941 -0.317275 -0.532614 -0.039915
## 12017 -0.121239  0.138539  0.256704 -0.112251
## 12117 -0.597125 -0.618290  0.078658  0.058192
```

```
## 12217 -0.364984 -0.360512 -0.250196 -0.379320
## 12317  0.392179 -0.195509 -0.520632  0.688871
## 12416 -0.504581 -0.228151 -0.481416 -0.091354
## 12516  0.549047 -0.737006  0.211156  0.958942
## 12616  0.006489  0.677002 -0.516300 -0.318650
## 12716 -0.597125 -0.618290  0.078658  0.058192
## 12816  0.304861 -0.180341  0.326027  0.613134
## 12914  0.082422 -0.047564  0.858685 -0.368823
## 13011  0.261111 -0.179145  0.774531 -0.230468
## 13113  0.379096 -0.691158  0.280632  0.254768
## 13211 -0.561941 -0.469966 -0.134273  0.001337
## 1339  -0.158291  0.029007 -0.109909 -0.357040
## 1347   0.414923 -0.421710  0.539759  0.271711
## 1357   0.374706 -0.315839  0.175966  1.021769
## 1367   0.309260  0.068157  0.293084  0.130120
## 1377  -0.561941 -0.469966 -0.134273  0.001337
## 1387   0.145233  0.521115 -0.027556 -0.475111
## 1397  -0.480533 -0.126772 -0.626952 -0.130213
## 1407  -0.363341  0.222309  0.499156  0.626782
## 14113 -0.531464 -0.341482 -0.318721 -0.047912
## 14210 -0.504581 -0.228151 -0.481416 -0.091354
## 1437   0.515996  0.279802 -0.679121  0.793453
## 1447   0.114096 -0.660068  0.277419 -0.171613
## 1457   0.405183 -0.187355 -0.008483  0.972520
## 1467   0.038097 -0.038681  0.199600 -0.656455
## 1477   0.012767  0.394078  0.021500 -0.288073
## 1487   0.318054 -0.092482 -0.161987  0.381349
## 1497  -0.531464 -0.341482 -0.318721 -0.047912
## 1507  -0.093700  0.638180 -0.056651  0.128671
## 15113 -0.314472 -0.232366  0.517715  0.092645
## 15210 -0.186900 -0.138270  0.654083 -0.006147
## 1537  -0.065566  0.035924  0.849137  0.020820
## 1547  -0.561941 -0.469966 -0.134273  0.001337
## 1567  -0.597125 -0.618290  0.078658  0.058192
## 1577   0.174798 -0.411521  0.187888 -0.434292
## 1587   0.670243 -0.839821 -0.185877  0.688627
## 1596  -0.504581 -0.228151 -0.481416 -0.091354
## 1607   0.497727  0.202785 -0.568557  0.822974
## 16113 -0.438919  0.048658 -0.878795 -0.197458
## 16210 -0.015425 -0.114204  0.413395 -0.489478
## 1636  -0.093700  0.638180 -0.056651  0.128671
## 1647  -0.561941 -0.469966 -0.134273  0.001337
## 1657  -0.597125 -0.618290  0.078658  0.058192
## 1667  -0.115454  0.546472  0.075002  0.163823
## 1677   0.285705 -0.584207 -0.637993  0.468147
## 1687   0.026978  0.426064  0.289063 -0.128725
## 1697  -0.398525  0.073985  0.712086  0.683636
## 1707  -0.281933  0.565503  0.006476  0.495231
## 17113  0.026978  0.426064  0.289063 -0.128725
## 17210 -0.314053 -0.145803 -0.558427 -0.461621
## 1736  -0.248811  0.044443  0.120336 -0.013459
## 1747   0.152356 -0.526705  0.399446 -0.051125
```

```
## 1757  -0.398525  0.073985  0.712086  0.683636
## 1767  -0.248811  0.044443  0.120336 -0.013459
## 1777  -0.115454  0.546472  0.075002  0.163823
## 1787  -0.112809 -0.103072  0.373310 -0.295617
## 1797  -0.364984 -0.360512 -0.250196 -0.379320
## 1806  -0.166384  0.331763  0.383233  0.246124
## 18113 -0.504581 -0.228151 -0.481416 -0.091354
## 18210 -0.030382  0.184248  0.636207 -0.036034
## 1837  -0.504581 -0.228151 -0.481416 -0.091354
## 1847  -0.531464 -0.341482 -0.318721 -0.047912
## 1857  -0.364984 -0.360512 -0.250196 -0.379320
## 1867  -0.363341  0.222309  0.499156  0.626782
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_bbalbatross1_reverse <- test.pca_bbalbatross1
test.pca_bbalbatross1_reverse$CA$u <- -(test.pca_bbalbatross1_reverse$CA$u)
test.pca_bbalbatross1_reverse$CA$v <- -(test.pca_bbalbatross1_reverse$CA$v)
g <- vegan::scores(test.pca_bbalbatross1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_bbalbatross1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xli
m=c(-3.5,3.5), main="", xlab="PC1 = 40%", ylab="PC2 = 29%", cex.lab=2, cex.axis=2)
with(data_bbalbatross, points(test.pca_bbalbatross1_reverse, display = "sites", col = col_point
s, scaling = scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_bbalbatross1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_bbalbatross <- summary(test.pca_bbalbatross1)

prop_bbalbatross <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_bbalbatross[j,i+1] <- as.numeric(abs(sum_all_bbalbatross$species[i,j])/sum(abs(sum_all_
bbalbatross$species[i,])))
  }
}

prop_bbalbatross
```

```
##   PC       prim      adult     breed      freq
## 1  1 0.12766388 0.56585337 0.4531121 0.1650286
## 2  2 0.39739817 0.04776178 0.2071259 0.4247620
## 3  3 0.42779351 0.12896306 0.1263846 0.2914390
## 4  4 0.04714444 0.25742179 0.2133774 0.1187703
```

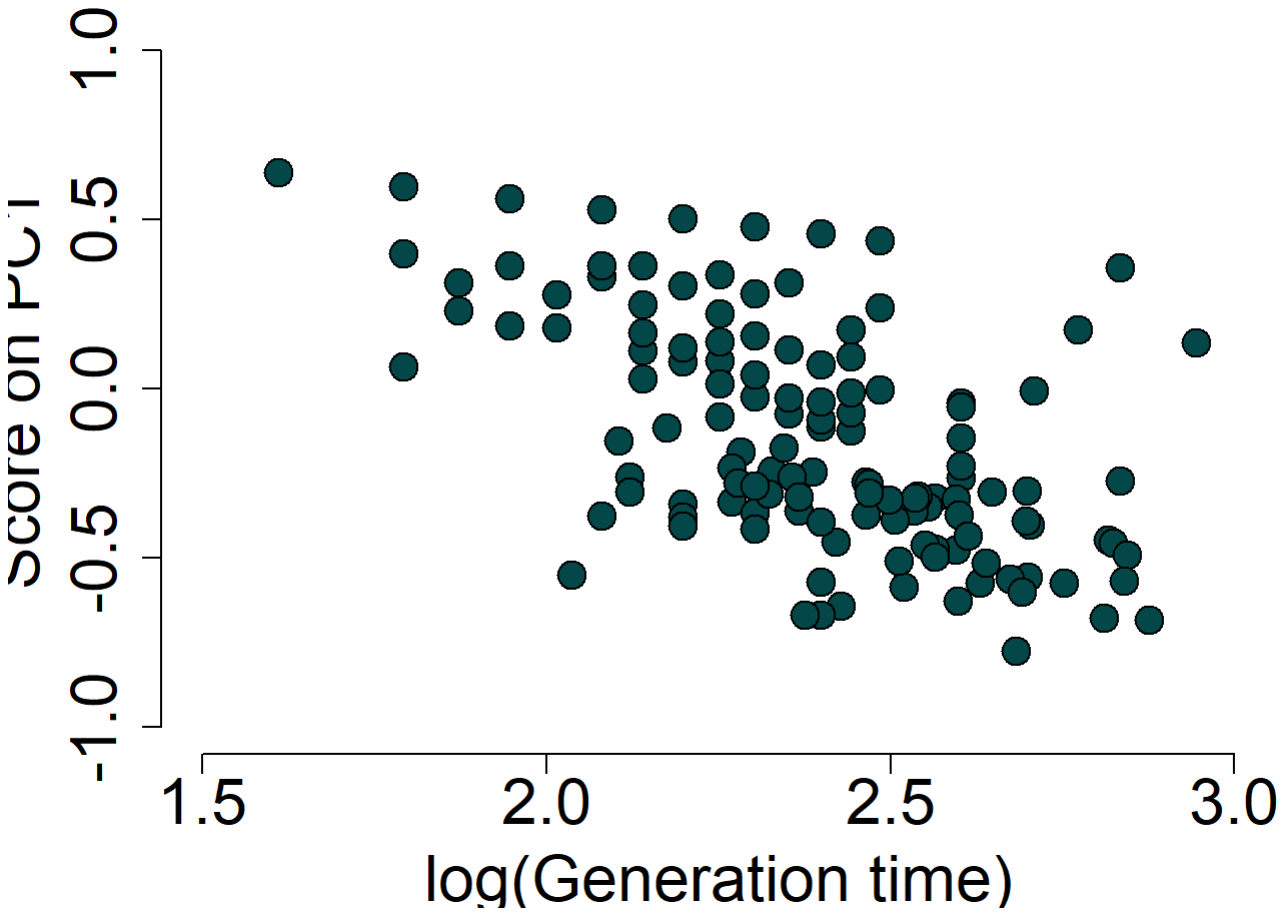
```
# Covariances
test <- as.matrix(scale(log(data_bbalbatross[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq    fec_one
## age_first_repro      1.00000000     0.02678666 -0.05856752 0.17947962
## lifetime_adult       0.02678666     1.00000000 -0.55050839 0.22718498
## breed_freq          -0.05856752    -0.55050839  1.00000000 0.08011988
## fec_one              0.17947962     0.22718498  0.08011988 1.00000000
```

```
# Correlation with generation time
individual_score_bbalbatross_reverse <- as.numeric(vegan::scores(test.pca_bbalbatross1_reverse)
$sites[,1])
summary(lm(individual_score_bbalbatross_reverse ~ log(data_bbalbatross$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_bbalbatross_reverse ~ log(data_bbalbatross$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.81929 -0.17548  0.00461  0.16026  0.86381
##
## Coefficients:
##                                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           2.25161    0.17371   12.96   <2e-16 ***
## log(data_bbalbatross$generation_time) -0.97275    0.07453  -13.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2771 on 183 degrees of freedom
## Multiple R-squared:  0.4821, Adjusted R-squared:  0.4793
## F-statistic: 170.4 on 1 and 183 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_bbalbatross$generation_time), individual_score_bbalbatross_reverse, pch=21, xlab
="log(Generation time)", ylab="Score on PC1", xlim=c(1.5,3), ylim=c(-1,1), bg=colors[3], cex=2,
cex.axis=2, cex.lab=2)
```



Snow petrel

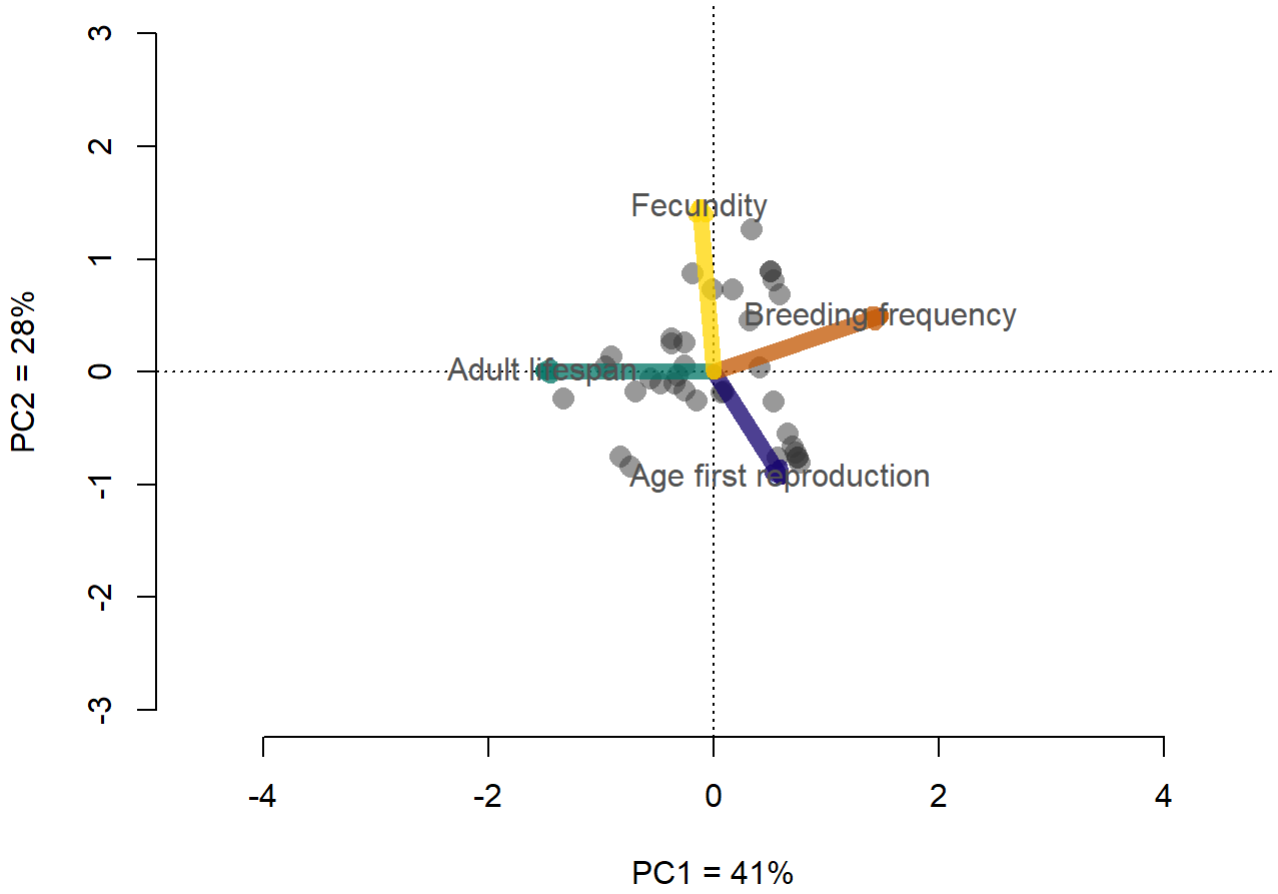
```
data_petrel <- data[which(data$species == "snowpetrel"),]
data_petrel$fec_one <- data_petrel$fecundity +  1
test.pca_petrel1 <- rda(log(data_petrel[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_petrel1)
```

```
##
## Call:
## rda(X = log(data_petrel[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3     PC4
## Eigenvalue            1.6489 1.1039 0.8881 0.35908
## Proportion Explained  0.4122 0.2760 0.2220 0.08977
## Cumulative Proportion 0.4122 0.6882 0.9102 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  3.439791
##
##
## Species scores
##
##                     PC1       PC2      PC3      PC4
## age_first_repro -0.5948  0.928424 -1.31979  0.02154
## lifetime_adult   1.5170 -0.006964 -0.40059 -0.70434
## breed_freq      -1.4859 -0.498022  0.05028 -0.70689
## fec_one          0.1207 -1.468147 -0.84976  0.25675
##
##
## Site scores (weighted sums of species scores)
##
##            PC1      PC2        PC3       PC4
## 1305   0.47036  0.10942 -0.9754955 -0.563479
## 4107   0.95685 -0.04646  0.1256678 -0.277999
## 6107   0.90286 -0.13051  0.0923567 -0.187150
## 7106  -0.70602  0.66319  0.0893757  0.005192
## 8106  -0.07034  0.18213 -1.1321806  0.790148
## 10106  0.36859 -0.29181  0.2223977 -0.020253
## 11106 -0.65786  0.55089  0.2878182 -0.002819
## 12102  0.73757  0.84253 -0.4234808  0.713841
## 1319  -0.57108  0.76103 -0.1726555 -0.366030
## 1519   0.82179  0.74976 -0.5185788  1.210971
## 1719  -0.58994 -0.68300 -0.5999619  0.660580
## 1819  -0.74851  0.76225 -0.0856630  0.012258
## 1918  -0.08650  0.17649  0.7424402 -0.907679
## 2018   0.31847  0.03433  0.0275879  0.159503
## 2118   0.25623 -0.05039 -0.2150545 -0.825765
## 2218   0.34672  0.10542  0.5081990 -0.233820
## 2318  -0.72789  0.71418 -0.0007192  0.008829
```

```
## 2418  -0.16721 -0.73195  0.1522873 -0.139993
## 2518   0.25341 -0.25815 -0.3541113 -0.468905
## 2617  -0.53434 -0.81264 -0.3708769  0.651333
## 2717   0.01022 -0.73316  0.0652948 -0.518280
## 2817  -0.53649  0.26792  0.7878532 -0.023004
## 2917  -0.33992 -1.26593  0.4301317  0.618999
## 3017  -0.74851  0.76225 -0.0856630  0.012258
## 3117   0.15265  0.25251  0.6905971 -0.757012
## 3217   0.18541 -0.86837  0.1508598 -0.785177
## 3317  -0.76801  0.80772 -0.1660129  0.015501
## 3417  -0.50295 -0.88581 -0.2415683  0.646113
## 3517  -0.31933 -0.45507  0.1815426 -0.013227
## 3817   0.69071  0.18037  1.3297793  0.692970
## 4017   0.36864 -0.25029 -0.9078535 -0.910999
## 4117  -0.40784 -0.03204  1.3179118 -0.044400
## 4217   1.33393  0.23518  0.7400894  1.129493
## 4317   0.25532  0.16561 -0.8312666 -0.086248
## 4417  -0.50295 -0.88581 -0.2415683  0.646113
## 4517   0.55594  0.05821 -0.6194796 -0.841863
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_petrel1_reverse <- test.pca_petrel1
test.pca_petrel1_reverse$CA$u <- -(test.pca_petrel1_reverse$CA$u)
test.pca_petrel1_reverse$CA$v <- -(test.pca_petrel1_reverse$CA$v)
g <- vegan::scores(test.pca_petrel1_reverse, display = "species", scaling=2)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_petrel1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=c(-
3.5,3.5), main="", xlab="PC1 = 41%", ylab="PC2 = 28%")
with(data_petrel, points(test.pca_petrel1_reverse, display = "sites", col = col_points, scaling
= scl, pch = 16, cex=1.5))
g <- vegan::scores(test.pca_petrel1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32")
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32")
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32")
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32")
```




```
# Test for proportion of variance explained per axe
sum_all_petrel <- summary(test.pca_petrel1)

prop_petrel <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_petrel[j,i+1] <- as.numeric(abs(sum_all_petrel$species[i,j])/sum(abs(sum_all_petrel$spe
cies[i,])))
  }
}

prop_petrel
```

```
##   PC        prim       adult      breed       freq
## 1  1 0.207637361 0.577055924 0.54207781 0.04478333
## 2  2 0.324109532 0.002648911 0.18168977 0.54469307
## 3  3 0.460733021 0.152375768 0.01834335 0.31526669
## 4  4 0.007520085 0.267919396 0.25788906 0.09525691
```

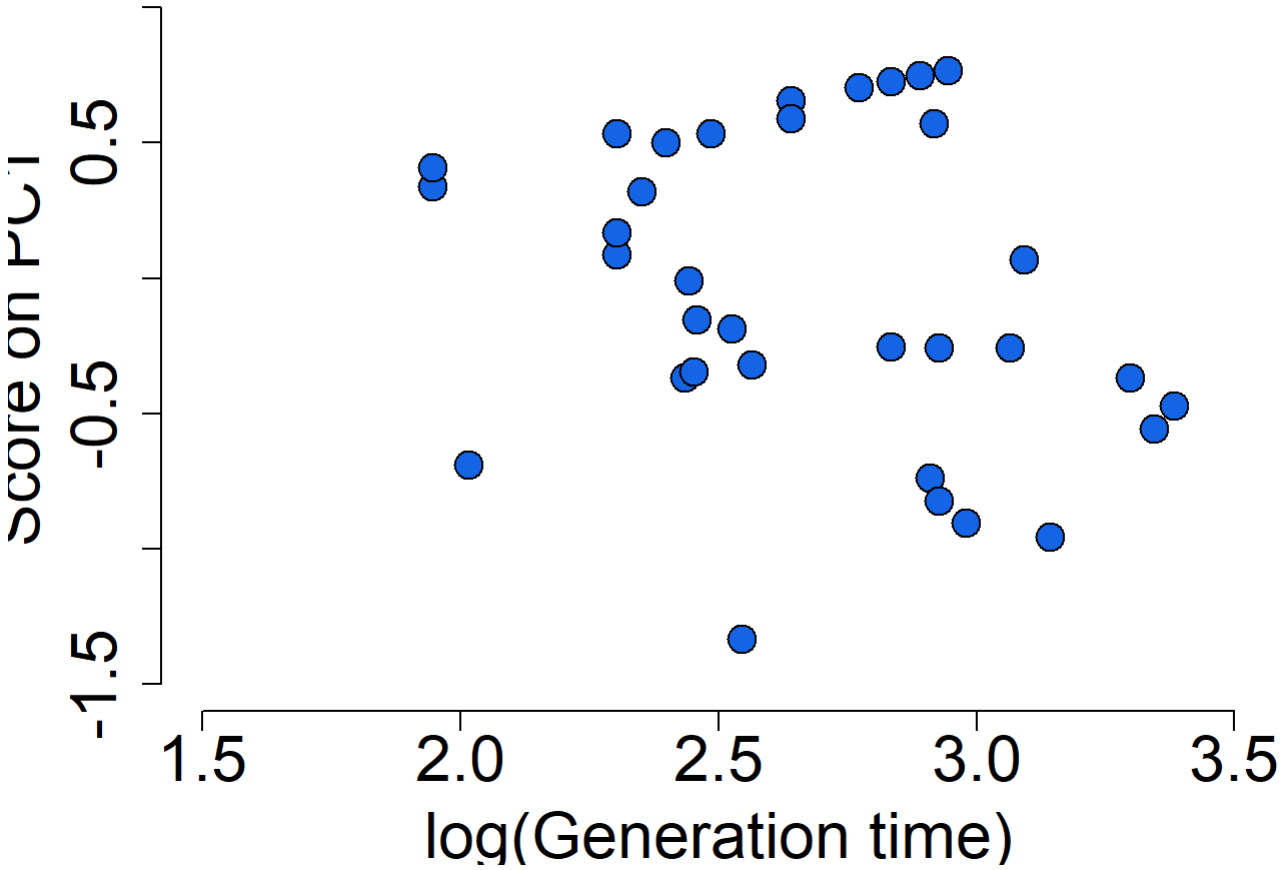
```
# Covariances
test <- as.matrix(scale(log(data_petrel[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq    fec_one
## age_first_repro       1.0000000     -0.1336237  0.1148762 -0.1040642
## lifetime_adult       -0.1336237      1.0000000 -0.5993510  0.1193029
## breed_freq            0.1148762     -0.5993510  1.0000000  0.1107467
## fec_one              -0.1040642      0.1193029  0.1107467  1.0000000
```

```
# Correlation with generation time
individual_score_petrel_reverse <- as.numeric(vegan::scores(test.pca_petrel1_reverse)$sites[,1])
summary(lm(individual_score_petrel_reverse ~ log(data_petrel$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_petrel_reverse ~ log(data_petrel$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.38214 -0.31964 -0.07465  0.41561  0.86866
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       0.9981     0.6977   1.431    0.162
## log(data_petrel$generation_time)  -0.3732     0.2584  -1.444    0.158
##
## Residual standard error: 0.5726 on 34 degrees of freedom
## Multiple R-squared:  0.05779,    Adjusted R-squared:  0.03008
## F-statistic: 2.085 on 1 and 34 DF,  p-value: 0.1579
```

```
par(bty="n")
plot(log(data_petrel$generation_time), individual_score_petrel_reverse, pch=21, xlab="log(Genera
tion time)", ylab="Score on PC1", xlim=c(1.5,3.5), ylim=c(-1.5,1), bg=colors[14], cex=2, cex.axi
s=2, cex.lab=2)
```



Southern fulmar

```
data_fulmar<- data[which(data$species == "antarcticfulmar"),]
data_fulmar$fec_one <- data_fulmar$fecundity +  1
test.pca_fulmar1 <- rda(log(data_fulmar[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_fulmar1)
```

```
##
## Call:
## rda(X = log(data_fulmar[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3     PC4
## Eigenvalue            1.8995 1.1071 0.6854 0.30796
## Proportion Explained  0.4749 0.2768 0.1713 0.07699
## Cumulative Proportion 0.4749 0.7517 0.9230 1.00000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  5.136323
##
##
## Species scores
##
##                     PC1     PC2     PC3      PC4
## age_first_repro -1.317  1.6008  1.5133 -0.09023
## lifetime_adult   2.002  1.2622 -0.3233 -0.94419
## breed_freq      -2.195 -0.8162 -0.2893 -1.01342
## fec_one         -1.403  1.5748 -1.4291  0.32326
##
##
## Site scores (weighted sums of species scores)
##
##             PC1        PC2       PC3       PC4
## 1290   0.320470  0.7020910  0.585354  0.235957
## 2100   0.402345 -0.2399767 -0.241616  0.075516
## 3100   0.871301  0.1857245  0.023748  0.762844
## 4100  -0.142810  0.5741452  0.632046  0.351223
## 5100   0.448438  0.0717192 -0.570428 -0.581875
## 6100  -0.033365  0.5788323  0.373442 -0.339798
## 7100  -0.119898 -0.1530982 -0.797518 -0.082867
## 8100  -0.077912 -0.6776497  0.503511 -0.122778
## 9100  -0.007050 -0.8254177  0.277873 -0.092835
## 10100  0.188288  0.5235654 -0.039512 -0.587406
## 11100  0.626975  0.0886987  0.146017  0.715524
## 1291  -0.355768  0.3517328  0.441440 -0.332275
## 1310  -0.418589  0.2902861 -0.001489 -0.020256
## 1410   0.500550  0.1289120 -0.072864 -0.396416
## 1510  -0.262230  0.2805506  0.123055 -0.386653
## 1610   0.262769  0.5513985  0.297933 -0.312088
## 1710   0.242837  0.4835777  0.372201  0.021182
```

```
## 1810  -0.007050 -0.8254177  0.277873 -0.092835
## 1910   0.424450 -0.0010427 -0.165900  0.791519
## 2010  -0.007050 -0.8254177  0.277873 -0.092835
## 2110   0.046442  0.4124093  0.119318 -0.306075
## 2210   0.293660  0.4131271  0.191235 -0.215028
## 2310   0.084306 -1.0159237 -0.013025 -0.054232
## 2410   0.400680  0.5385316  0.161961 -0.043331
## 2510   0.471527  0.3647706  0.539771 -0.304906
## 2610  -0.044454 -0.7474206  0.396973 -0.108640
## 2710  -0.122696  0.0005441  0.091261 -0.454295
## 2810   0.050950  0.1113244  0.154694  0.040183
## 2910   0.009483  0.2565670  0.147112  0.415575
## 3010  -0.622312  0.4082867  0.382115  0.216459
## 3110   0.151648  0.2615937  0.033963 -0.788507
## 3210   0.188075  0.2863596  0.108777  0.373846
## 3310  -0.058464  0.3711754  0.561586 -0.502195
## 3410  -0.034435  0.4383295  0.134854 -0.714727
## 3510  -0.416969 -0.0199165 -0.271740  0.303228
## 3610   0.841600  0.4629451  0.526166  0.967091
## 3710   0.204860  0.2651354 -0.080432 -0.508082
## 3810   0.695855  0.3069531  0.345501  0.209965
## 3910  -0.606818  0.3759773  0.332780  0.223006
## 4010  -0.416969 -0.0199165 -0.271740  0.303228
## 4110  -0.108179 -0.6145344  0.599887 -0.135568
## 4210   0.062533  0.1459420 -0.021809  0.437992
## 4310  -0.386702 -0.0830318 -0.368116  0.316018
## 4410   0.715745  0.1797864  0.332209  0.631257
## 4510   0.243614  0.3140574 -0.099982 -0.533717
## 4610   0.418286  0.0528058 -0.318238 -0.718006
## 4710  -0.135810 -0.5569145  0.687871 -0.147243
## 4810  -0.077912 -0.6776497  0.503511 -0.122778
## 4910   1.112822  0.1257723 -0.264918  0.963087
## 5010  -0.059879  0.3611573  0.078194 -0.353054
## 5110   0.336555  0.2214296  0.454419  0.171702
## 5210  -0.444600  0.0377034 -0.183756  0.291552
## 5310  -0.264569 -0.2884114  1.097868 -0.201651
## 5410  -0.172733  0.1906919 -0.151969 -0.429617
## 5510   1.055186  0.2136759  0.166070  0.961402
## 5610   0.114863  0.0205143 -0.526507 -0.354649
## 5710   0.051540  0.4048178 -0.024256 -0.442169
## 5810  -0.386702 -0.0830318 -0.368116  0.316018
## 5910  -0.637084  0.4390927  0.429155  0.210217
## 6010   0.377668  0.3522118 -0.203489 -0.358865
## 6110   0.309925  0.1800265 -0.101969 -0.722215
## 6210   0.386631  0.0178441 -0.258473  0.126107
## 6310   0.385952  0.1010319  0.075675 -0.254210
## 6410   0.035354 -0.9138436  0.142849 -0.074917
## 6510  -0.011306 -0.5097196  0.556516 -0.417433
## 6610  -0.059879  0.3611573  0.078194 -0.353054
## 6710   0.725618  0.0383059  0.026764  0.324571
## 6810   0.244825  0.1844616 -0.154237 -0.569855
## 6910   0.516743  0.1525040  0.145752 -0.074958
```

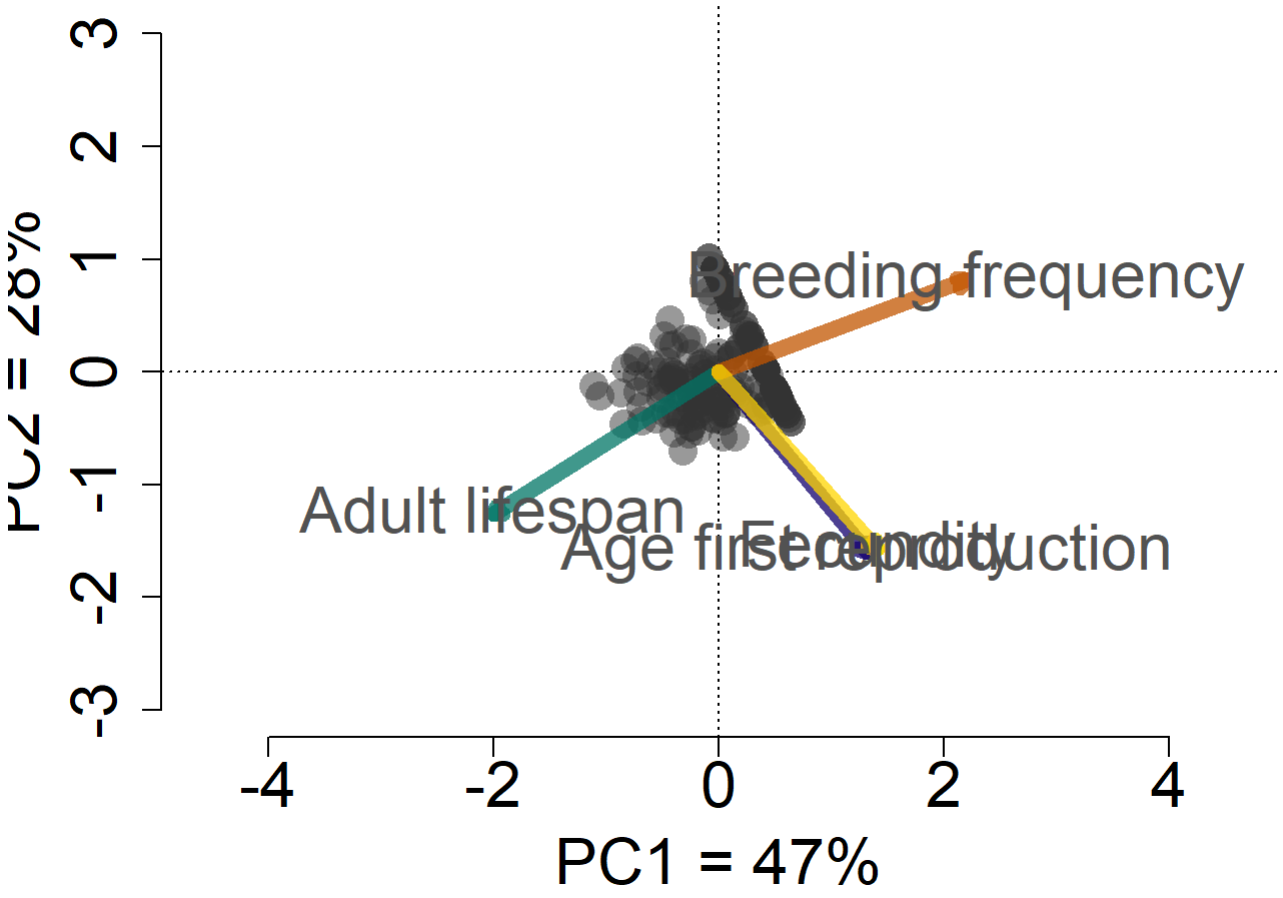
```
## 7010   0.487398 -0.3173582 -0.074486  0.264055
## 7110   0.047470 -0.1270537 -1.006408 -0.406732
## 7210  -0.606818  0.3759773  0.332780  0.223006
## 7310   0.132226 -0.8090288  0.099479 -0.356783
## 7410  -0.022841  0.2992793 -0.331577 -0.790468
## 7510   0.163661 -0.0649413 -0.343823  0.480724
## 7610   0.466854 -0.0894686 -0.300924  0.809437
## 7710  -0.493552  0.1397835 -0.027882  0.270867
## 7810   0.104555  0.0965392 -0.391130 -0.527966
## 7910   0.742515 -0.0971708 -0.068166  0.552481
## 8010   0.035354 -0.9138436  0.142849 -0.074917
## 8110   0.602489 -0.0592968 -0.234879  0.472489
## 8210  -0.439084  0.3330241  0.063771 -0.028916
## 8310   0.101361  0.2147914 -0.336250 -0.990115
## 8410   0.126258  0.0130558 -0.224723  0.464919
## 8510  -0.191369  0.1327826 -0.102583 -0.356710
## 8610   0.247431 -0.1600493 -0.241166 -0.707763
## 8810   0.444994 -0.2289323  0.060538  0.246137
## 8910  -0.136291  0.1879103 -0.480227 -0.412594
## 9010  -0.256372 -0.0479879 -0.518025  0.048290
## 9110   0.230227  0.0774000 -0.502376 -0.624708
## 9710   0.401335  0.0720671 -0.288857  0.363885
## 9810   0.512382  0.2260970  0.089163  0.345295
## 9910  -0.227166 -0.3664085  0.978769 -0.185847
## 10010 -0.135810 -0.5569145  0.687871 -0.147243
## 10110  0.214030  0.3917082  0.130245 -0.455503
## 10210 -0.637084  0.4390927  0.429155  0.210217
## 10310  0.265251  0.0554073  0.552258 -0.092083
## 10410  0.421550  0.3740558  0.193305 -0.060780
## 10510 -0.493552  0.1397835 -0.027882  0.270867
## 10610 -0.273437 -0.3192256 -0.728778  0.363879
## 10710 -0.119898 -0.1530982 -0.797518 -0.082867
## 10810 -0.001569 -0.1662372 -0.696991 -0.357291
## 10910  0.188440  0.3696893 -0.002566 -0.020430
## 11010  0.180145 -0.0294294 -0.668842 -0.110569
## 11110  0.108891  0.0651427  0.427713  0.274315
## 11210 -0.016095  0.2570553 -0.109970 -0.834343
## 11410  0.009483  0.2565670  0.147112  0.415575
## 11510 -0.176565 -0.2144109 -0.772148  0.082013
## 11610  0.290101 -0.2922709  0.620550  0.114614
## 11710  0.544868 -0.0022769 -0.383349 -0.164783
## 11810  0.235126  0.2020200 -0.176808 -0.495293
## 11910 -0.416969 -0.0199165 -0.271740  0.303228
## 12010  0.032074 -0.0153764 -0.136469 -0.711695
## 12110  0.402138  0.0270229 -0.539618 -0.182291
## 12210 -0.606818  0.3759773  0.332780  0.223006
## 12310 -0.493552  0.1397835 -0.027882  0.270867
## 12510 -0.347728  0.1425181 -0.227127  0.009687
## 12610 -0.079692 -0.1095962 -0.815519 -0.199852
## 12710 -0.535956  0.2282094  0.107142  0.252949
## 12810 -0.535956  0.2282094  0.107142  0.252949
## 1292  -0.535956  0.2282094  0.107142  0.252949
```

```
## 1301  -0.515462  0.1854713  0.041882  0.261610
## 1311  -0.044454 -0.7474206  0.396973 -0.108640
## 1321  -0.315841 -0.2307998 -0.593754  0.345960
## 1331  -0.493552  0.1397835 -0.027882  0.270867
## 1341  -0.573360  0.3062065  0.226241  0.237144
## 1351  -0.573360  0.3062065  0.226241  0.237144
## 1361  -0.590529  0.3420104  0.280913  0.229889
## 1371   0.721816 -0.1264618 -0.377427  0.308814
## 1381  -0.493552  0.1397835 -0.027882  0.270867
## 1391   0.431434 -0.4596522  0.280536  0.040362
## 1401  -0.007050 -0.8254177  0.277873 -0.092835
## 1411  -0.246418 -0.3262623  1.040071 -0.193982
## 1421   0.035354 -0.9138436  0.142849 -0.074917
## 1431  -0.044454 -0.7474206  0.396973 -0.108640
## 1441  -0.112967  0.1522405 -0.066599 -0.552477
## 1451  -0.416969 -0.0199165 -0.271740  0.303228
## 1461   0.823127 -0.0322365  0.215920  0.822015
## 1471  -0.535956  0.2282094  0.107142  0.252949
## 1481   0.084306 -1.0159237 -0.013025 -0.054232
## 1491  -0.416969 -0.0199165 -0.271740  0.303228
## 1501  -0.555208  0.2683556  0.168444  0.244814
## 1511  -0.224485 -0.4213058 -0.884652  0.384564
## 1521  -0.224485 -0.4213058 -0.884652  0.384564
## 1531   0.089822 -0.7206030  0.234503 -0.374701
## 1541   0.309286  0.0965287  0.014972 -0.233046
## 1551   0.111626  0.3219289 -0.229682 -0.642612
## 1561  -0.515462  0.1854713  0.041882  0.261610
## 1571  -0.515462  0.1854713  0.041882  0.261610
## 1581  -0.535956  0.2282094  0.107142  0.252949
## 1601   0.035354 -0.9138436  0.142849 -0.074917
## 1611  -0.535956  0.2282094  0.107142  0.252949
## 1621   0.035354 -0.9138436  0.142849 -0.074917
## 1641  -0.418589  0.2902861 -0.001489 -0.020256
## 1651   0.052419 -0.6426058  0.353602 -0.390506
## 1661   0.142306 -0.0791816 -0.136204  0.078786
## 1671  -0.273437 -0.3192256 -0.728778  0.363879
## 1681  -0.493552  0.1397835 -0.027882  0.270867
## 1691   0.243527  0.4881019 -0.119697 -0.688131
## 1701   0.234544 -0.2834299 -0.655551 -0.027621
## 1711  -0.176565 -0.2144109 -0.772148  0.082013
## 1721   0.336558  0.4261813  0.056821 -0.184324
## 1741  -0.315841 -0.2307998 -0.593754  0.345960
## 1751  -0.009488  0.3552426 -0.192926 -0.580055
## 1761  -0.315841 -0.2307998 -0.593754  0.345960
## 1771  -0.273437 -0.3192256 -0.728778  0.363879
## 1781  -0.077912 -0.6776497  0.503511 -0.122778
## 1791   0.680871  0.4343728  0.382025  0.388989
## 1811   0.561898  0.4198252  0.093179 -0.063811
## 1821  -0.416969 -0.0199165 -0.271740  0.303228
## 1831  -0.535956  0.2282094  0.107142  0.252949
## 1841  -0.416969 -0.0199165 -0.271740  0.303228
## 1851  -0.373146  0.1955232 -0.146189 -0.001054
```

```
## 1861  -0.108179 -0.6145344  0.599887 -0.135568
## 1871  -0.515462  0.1854713  0.041882  0.261610
```

```
# have the scores reversed to have the adult lifespan to the left
test.pca_fulmar1_reverse <- test.pca_fulmar1
test.pca_fulmar1_reverse$CA$u <- -(test.pca_fulmar1_reverse$CA$u)
test.pca_fulmar1_reverse$CA$v <- -(test.pca_fulmar1_reverse$CA$v)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_fulmar1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=c(-3.5,3.5), main="", xlab="PC1 = 47%", ylab="PC2 = 28%", cex.lab=2, cex.axis=2)
with(data_fulmar, points(test.pca_fulmar1_reverse, display = "sites", col = col_points, scaling = scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_fulmar1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, col_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```



```
# Test for proportion of variance explained per axe
sum_all_fulmar <- summary(test.pca_fulmar1)

prop_fulmar <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_fulmar[j,i+1] <- as.numeric(abs(sum_all_fulmar$species[i,j])/sum(abs(sum_all_fulmar$spe
cies[i,])))
  }
}

prop_fulmar
```

```
##   PC       prim      adult      breed       freq
## 1  1 0.29130561 0.44171685 0.50882618 0.29663068
## 2  2 0.35405200 0.27855732 0.18919708 0.33291829
## 3  3 0.33468593 0.07135507 0.06706649 0.30211259
## 4  4 0.01995646 0.20837076 0.23491025 0.06833844
```

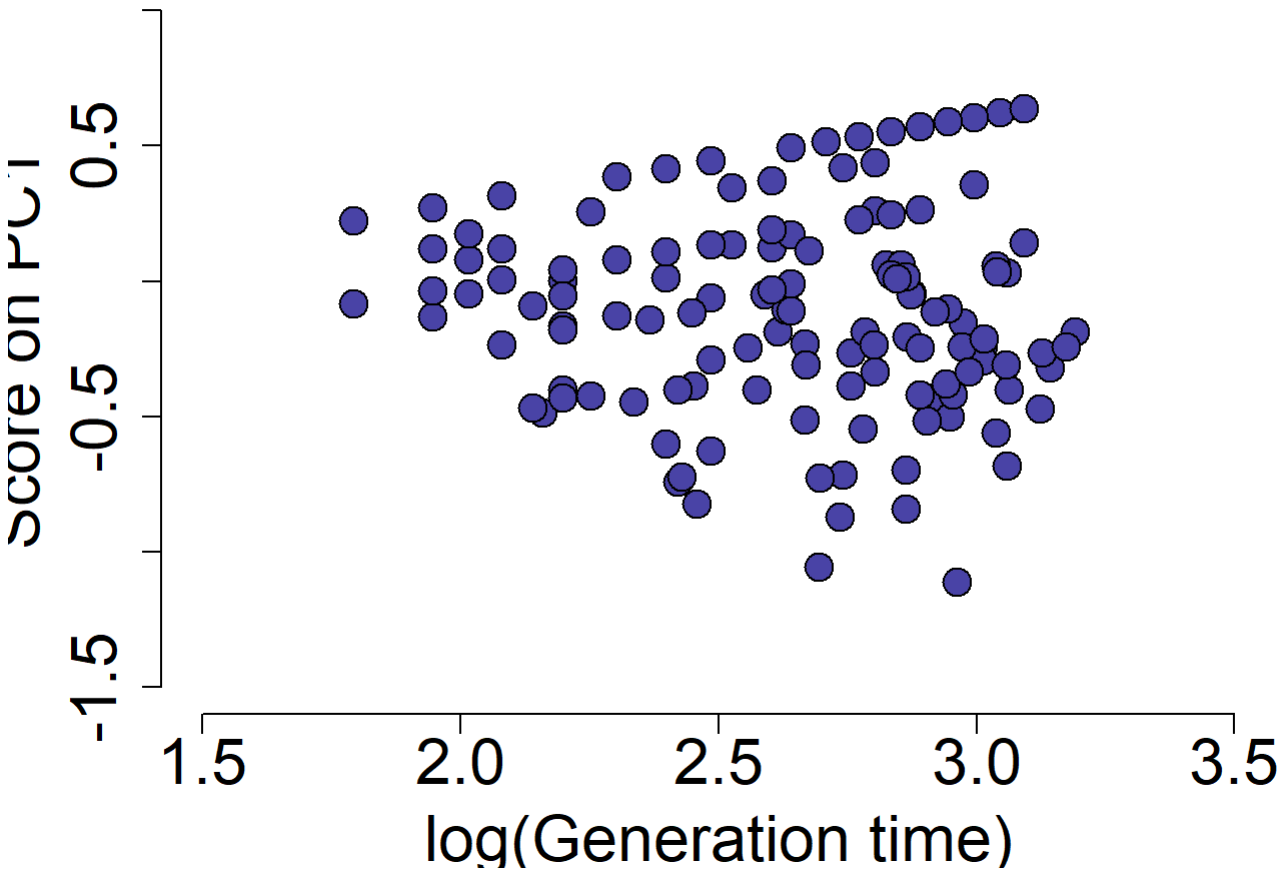
```
# Covariances
test <- as.matrix(scale(log(data_fulmar[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq    fec_one
## age_first_repro       1.0000000     -0.1546158  0.1877387  0.3301237
## lifetime_adult       -0.1546158      1.0000000 -0.6631023 -0.1006552
## breed_freq            0.1877387     -0.6631023  1.0000000  0.2851299
## fec_one               0.3301237     -0.1006552  0.2851299  1.0000000
```

```
# Correlation with generation time
individual_score_fulmar_reverse <- as.numeric(vegan::scores(test.pca_fulmar1_reverse)$sites[,1])
summary(lm(individual_score_fulmar_reverse ~ log(data_fulmar$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_fulmar_reverse ~ log(data_fulmar$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.08871 -0.23838 -0.00536  0.28531  0.66920
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.15929    0.21312   0.747    0.456
## log(data_fulmar$generation_time) -0.06192    0.08205  -0.755    0.451
##
## Residual standard error: 0.3899 on 173 degrees of freedom
## Multiple R-squared:  0.003281,   Adjusted R-squared:  -0.00248
## F-statistic: 0.5696 on 1 and 173 DF,  p-value: 0.4515
```

```
par(bty="n")
plot(log(data_fulmar$generation_time), individual_score_fulmar_reverse, pch=21, xlab="log(Genera
tion time)", ylab="Score on PC1", xlim=c(1.5,3.5), ylim=c(-1.5,1), bg=colors[1], cex=2, cex.axis
=2, cex.lab=2)
```



Yellow-bellied marmot

```
data_marmots <- data[which(data$species == "yellowbelliedmarmots"),]
data_marmots$fec_one <- data_marmots$fecundity +  1
test.pca_marmots1 <- rda(log(data_marmots[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_marmots1)
```

```
##
## Call:
## rda(X = log(data_marmots[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.6139 1.0923 0.7786 0.5152
## Proportion Explained  0.4035 0.2731 0.1946 0.1288
## Cumulative Proportion 0.4035 0.6766 0.8712 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  5.885662
##
##
## Species scores
##
##                     PC1     PC2     PC3     PC4
## age_first_repro -1.603 -1.4414 -1.9980  0.1397
## lifetime_adult  -2.345  0.7538  0.6748  1.4617
## breed_freq       1.897 -1.7998  0.3292  1.3089
## fec_one         -1.519 -1.8906  1.4789 -0.7697
##
##
## Site scores (weighted sums of species scores)
##
##              PC1       PC2       PC3        PC4
## 1340  -0.3496789 -0.313018 -0.248756  0.3942503
## 2137  -0.4116509 -0.254149  0.216295  0.4480475
## 3129   0.0905703 -0.017877  0.253862  0.0355201
## 4130   0.2350444 -0.138594  0.199711 -0.3262723
## 5128   0.2835472 -0.049378  0.101806 -0.2492679
## 6128  -0.3390970 -0.453950 -0.171555  0.1656955
## 7124  -0.7162943  0.087879 -0.624051 -0.0082626
## 8124   0.1666835 -0.264338  0.337700 -0.4348039
## 9123   0.4687718  0.291326 -0.272077  0.0447998
## 10123  0.0481991 -0.095816  0.339390 -0.0317497
## 11120 -0.3293703 -0.587137 -0.727207  0.1082254
## 12108 -0.2363826 -0.491083 -0.239974 -0.0170406
## 1348  -0.3496789 -0.313018 -0.248756  0.3942503
## 1430  -0.1034497 -0.246565 -0.508304  0.1940073
## 1538   0.1666835 -0.264338  0.337700 -0.4348039
## 1630  -0.1486032  0.003637 -0.175764  0.5198610
## 1737  -0.1647884 -0.704586 -0.518457 -0.3443537
```

```
## 1838  -0.0594391  0.007250 -0.257184  0.4160653
## 1929  -0.4486845  0.869021 -0.009306 -0.7672846
## 2029  -0.5198307 -0.173863 -0.183126  0.8157296
## 2138   0.1974227 -0.207796  0.275651 -0.3860015
## 2229   0.1849208  0.155672  0.063412  0.1853136
## 2329  -0.5198689  0.354710 -0.170230 -0.0402205
## 2428   0.4687718  0.291326 -0.272077  0.0447998
## 2528   0.3220931  0.096513 -0.650932  0.0848247
## 2626   0.0179336  0.234977  0.163007  0.5113634
## 2726  -0.0059847 -0.506956  0.011305 -0.4360408
## 2826   0.3017845  0.370632 -0.172482  0.3708496
## 2926   0.0574246  0.222210 -0.493077  0.6016014
## 3026  -0.1469824 -0.379845  0.058440 -0.0687292
## 3130   0.0905703 -0.017877  0.253862  0.0355201
## 3226  -0.0561083 -0.212691 -0.124993  0.0755450
## 3326  -0.5343503  0.516154  0.340896 -0.3826616
## 3426   0.2350444 -0.138594  0.199711 -0.3262723
## 3526   0.3017845  0.370632 -0.172482  0.3708496
## 3625  -0.1393123 -0.214659  0.578975  0.0163604
## 3725   0.3519081  0.076366 -0.036183 -0.1407362
## 3826  -0.6983605  0.675937 -0.264185 -0.1183804
## 3925  -0.0533261 -0.540831 -0.372006 -0.3175786
## 4026  -0.3679323 -0.087786  0.075234  0.6489267
## 4133   0.4687718  0.291326 -0.272077  0.0447998
## 4226  -0.2032853 -0.047521  0.533096  0.3504624
## 4326   0.3017845  0.370632 -0.172482  0.3708496
## 4426   0.4687718  0.291326 -0.272077  0.0447998
## 4526   0.3220931  0.096513 -0.650932  0.0848247
## 4625  -0.3120563  0.080124  0.551277  0.6790791
## 4725   0.0304354 -0.128490  0.375247 -0.0599517
## 4825   0.2835472 -0.049378  0.101806 -0.2492679
## 4925   0.3519081  0.076366 -0.036183 -0.1407362
## 5025   0.4687718  0.291326 -0.272077  0.0447998
## 5129  -0.5655482  0.654061  0.226588 -0.9528206
## 5225  -0.4952428  0.689742  0.199492 -0.1650771
## 5325   0.4687718  0.291326 -0.272077  0.0447998
## 5425   0.0680571 -0.059288  0.299306 -0.0002225
## 5525  -0.3075926 -0.164396  0.068713  0.4577570
## 5625   0.4687718  0.291326 -0.272077  0.0447998
## 5725   0.4687718  0.291326 -0.272077  0.0447998
## 5825  -0.3421215 -0.040848  0.652317  0.5308934
## 5925   0.4687718  0.291326 -0.272077  0.0447998
## 6025  -0.3179947 -0.415135 -0.214151  0.1991981
## 6129   0.4687718  0.291326 -0.272077  0.0447998
## 6224   0.2334236  0.244888 -0.034493  0.2623180
## 6324   0.4687718  0.291326 -0.272077  0.0447998
## 6424  -0.4540341 -0.380556 -0.114561  0.4188853
## 6523  -0.3317756 -0.625281 -0.418862 -0.0183039
## 6623   0.2052294 -0.118447 -0.415039 -0.1007114
## 6723   0.7195206  0.624362  0.375580 -0.0236232
## 6823  -0.1969223 -0.035817  0.520252  0.3605644
## 6923   0.0507440 -0.402609 -0.103204 -0.3459767
```

```
## 7020   0.3519081  0.076366 -0.036183 -0.1407362
## 7125   0.3519081  0.076366 -0.036183 -0.1407362
## 7220  -0.2832305 -0.243998  0.095987  0.3061229
## 7320  -0.6157373  0.113625  0.082920 -0.0074811
## 7420  -0.0296242 -0.012898  0.357565  0.1905044
## 7520  -0.4059247  0.489312  0.274701 -0.1322155
## 7620   0.0200049 -0.459151 -0.041156 -0.3947790
## 7720  -0.0925531  0.156161  0.309579  0.5262638
## 7820  -0.1826917 -0.392324 -0.348352  0.0682005
## 7920  -0.0284979 -0.548367  0.056749 -0.4717835
## 8020   0.4687718  0.291326 -0.272077  0.0447998
## 8125  -0.5710311 -0.268042 -0.079776  0.7344423
## 8219  -0.9064840  0.582868 -0.847940 -0.2862322
## 8320   0.0905703 -0.017877  0.253862  0.0355201
## 8420  -0.4276162  0.355786  0.409570  0.1700803
## 8519   0.1472991  0.086470  0.139353  0.1255843
## 8620  -0.0357573  0.136218  0.271384  0.4261223
## 8719  -0.7163062  0.696134 -0.706832  0.0467514
## 8820   0.3519081  0.076366 -0.036183 -0.1407362
## 8920  -0.4933453  0.338754 -0.164133  0.1868318
## 9020  -0.0059847 -0.506956  0.011305 -0.4360408
## 9124   0.0179336  0.234977  0.163007  0.5113634
## 9219   0.1472991  0.086470  0.139353  0.1255843
## 9319   0.1165599  0.029928  0.201401  0.0767819
## 9418  -0.4415511  0.423780  0.346615 -0.1887770
## 9518   0.1406939 -0.312143  0.390161 -0.4760657
## 9618   0.2835472 -0.049378  0.101806 -0.2492679
## 9719  -0.7404569  0.140820 -0.320423 -0.4336755
## 9819  -0.2591039 -0.199619  0.047286  0.3444270
## 9919  -0.0556138 -0.060703  0.410026  0.1492426
## 10019 -0.1826917 -0.392324 -0.348352  0.0682005
## 10124  0.1666835 -0.264338  0.337700 -0.4348039
## 10219 -0.3179947 -0.415135 -0.214151  0.1991981
## 10319  0.0481991 -0.095816  0.339390 -0.0317497
## 10419 -0.0672459 -0.082099  0.433506  0.1307752
## 10519 -0.1779236  0.175772 -0.255493  0.8191196
## 10619 -0.2821924  0.679352  0.091598  0.6301708
## 10719  0.1974227 -0.207796  0.275651 -0.3860015
## 10819  0.2350444 -0.138594  0.199711 -0.3262723
## 10918  0.2835472 -0.049378  0.101806 -0.2492679
## 11018  0.1974227 -0.207796  0.275651 -0.3860015
## 11121 -0.1162432 -0.323303 -0.003609 -0.0199269
## 11218 -0.0984796 -0.290629 -0.039465  0.0082752
## 11317  0.1974227 -0.207796  0.275651 -0.3860015
## 11418 -0.1041852  0.134764  0.333059  0.5077963
## 11518 -0.0379254 -0.254234  0.513236 -0.1684834
## 11618 -0.2602227 -0.050599  0.585563  0.4155632
## 11718 -0.0301187 -0.164885 -0.177454  0.1168068
## 11818 -0.6466229  0.027931  0.176712  0.0952750
## 11918  0.1666835 -0.264338  0.337700 -0.4348039
## 12018 -0.0071109  0.028513  0.312122  0.2262470
## 12118 -0.0137988 -0.209855  0.464535 -0.1301793
```

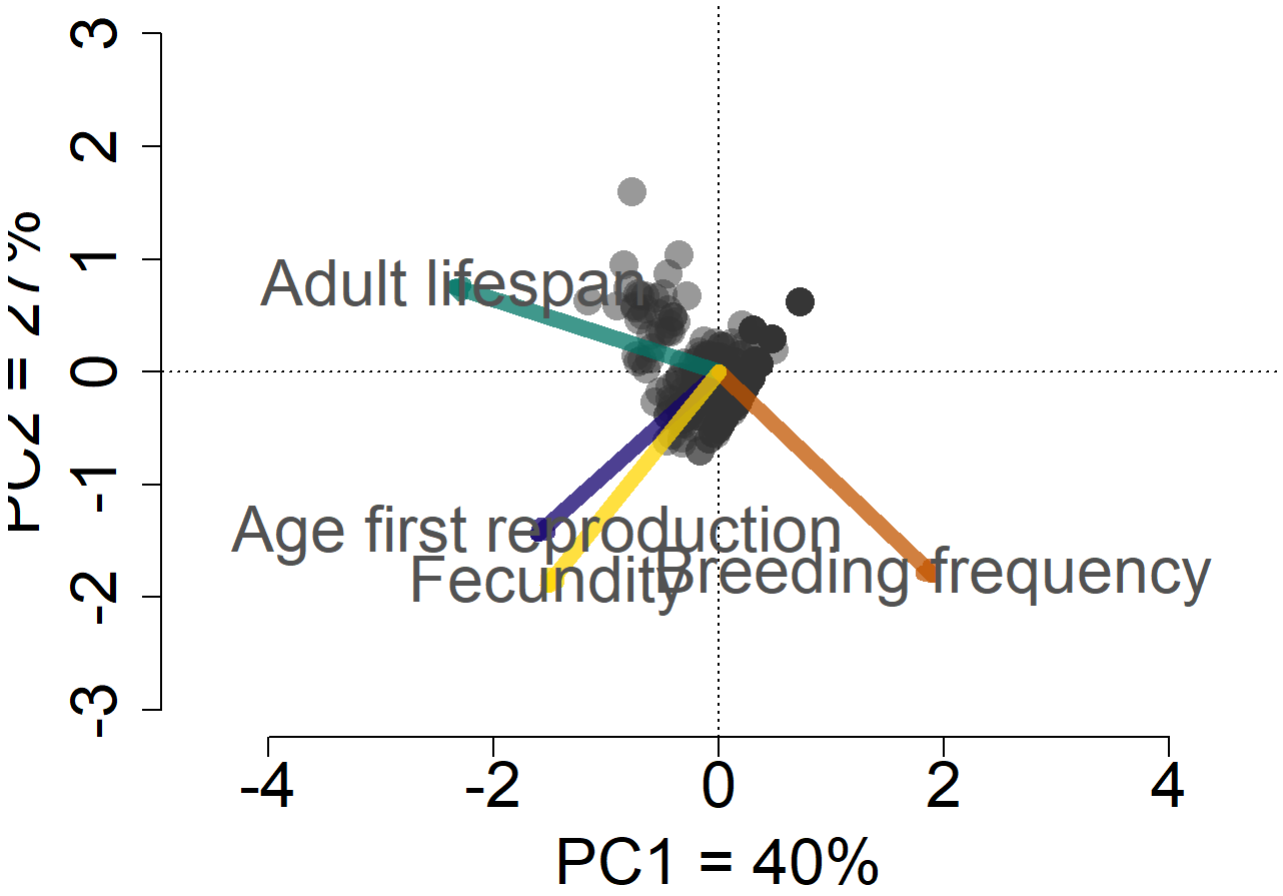
```
## 12218 -0.0840653 -0.597373 -0.309958 -0.3663809
## 12318  0.2180229 -0.041709 -0.919734  0.1132228
## 12417  0.1974227 -0.207796  0.275651 -0.3860015
## 12517 -0.5960730  0.214540 -0.016409 -0.1612042
## 12617 -0.0296242 -0.012898  0.357565  0.1905044
## 12717 -0.7745631  1.602633 -0.310536 -1.2468194
## 12817 -0.1365518 -0.049185  0.474842  0.2660981
## 12915  0.4687718  0.291326 -0.272077  0.0447998
## 13012  0.3220931  0.096513 -0.650932  0.0848247
## 13114  0.0507440 -0.402609 -0.103204 -0.3459767
## 13212  0.1368685 -0.244191 -0.277050 -0.2092430
## 13310  0.2835472 -0.049378  0.101806 -0.2492679
## 1349  -0.3130246 -0.459198  0.254688  0.0134661
## 1358   0.0883657 -0.333407 -0.179145 -0.2862474
## 1368  -0.0059847 -0.506956  0.011305 -0.4360408
## 1378  -0.0003037 -0.185032  0.437295 -0.1087541
## 1388   0.4687718  0.291326 -0.272077  0.0447998
## 1398   0.4687718  0.291326 -0.272077  0.0447998
## 1408  -0.2248056 -0.296927  0.076615  0.1535249
## 14114  0.1179787  0.258605  0.059623  0.4248428
## 14211 -0.3399593 -0.348345  0.210496  0.2160588
## 1438  -0.1663668 -0.029037 -0.139907  0.4916590
## 1448  -0.4059247  0.489312  0.274701 -0.1322155
## 1458  -0.2537793 -0.350222  0.135099  0.1075254
## 1468  -0.7408732  0.566952 -0.193005 -0.7129205
## 1478   0.0680571 -0.059288  0.299306 -0.0002225
## 1488  -0.1239746 -0.186447  0.548015  0.0407110
## 1498   0.4687718  0.291326 -0.272077  0.0447998
## 1508   0.3017845  0.370632 -0.172482  0.3708496
## 15114 -0.8111192  0.749754 -0.242937 -0.3471663
## 15211 -0.0658280 -0.177363 -0.584245  0.2537365
## 1539   0.0905703 -0.017877  0.253862  0.0355201
## 1548  -0.1572243  0.138857  0.377656  0.5790864
## 1557   0.0089217  0.132993 -0.395173  0.5245970
## 1568   0.3220931  0.096513 -0.650932  0.0848247
## 1578  -0.2248056 -0.296927  0.076615  0.1535249
## 1588   0.4687718  0.291326 -0.272077  0.0447998
## 1597   0.4687718  0.291326 -0.272077  0.0447998
## 1608  -0.2032853 -0.047521  0.533096  0.3504624
## 16114  0.7195206  0.624362  0.375580 -0.0236232
## 16211 -0.0854287 -0.040556 -0.204723  0.3748035
## 1637   0.0200049 -0.459151 -0.041156 -0.3947790
## 1648   0.2835472 -0.049378  0.101806 -0.2492679
## 1658   0.3519081  0.076366 -0.036183 -0.1407362
## 1668   0.3017845  0.370632 -0.172482  0.3708496
## 1678  -0.0533261 -0.540831 -0.372006 -0.3175786
## 1688   0.0304354 -0.128490  0.375247 -0.0599517
## 1698  -0.4498532  0.547165  0.246785 -0.4388238
## 1708   0.2350444 -0.138594  0.199711 -0.3262723
## 17114  0.0481991 -0.095816  0.339390 -0.0317497
## 17211 -0.4324541 -0.132017  0.159726  0.6603748
## 1738   0.2350444 -0.138594  0.199711 -0.3262723
```

```
## 1748  -0.6840740  0.105876 -0.317647 -0.1072943
## 1758  -0.7122268  0.459248 -0.152268 -0.9127957
## 1768   0.1165599  0.029928  0.201401  0.0767819
## 1778   0.1368685 -0.244191 -0.277050 -0.2092430
## 1788  -0.6554981  0.563595 -0.266777 -0.8227316
## 1798   0.0883657 -0.333407 -0.179145 -0.2862474
## 1807  -0.4326902 -0.239643 -0.220109  0.6082677
## 18114 -0.1647884 -0.704586 -0.518457 -0.3443537
## 18211 -0.0262933 -0.232838  0.489756 -0.1500159
## 1839   0.1974227 -0.207796  0.275651 -0.3860015
## 1848   0.2350444 -0.138594  0.199711 -0.3262723
## 1858   0.3519081  0.076366 -0.036183 -0.1407362
## 1868  -0.7468633  0.586721 -0.166280 -0.1953848
## 1877   0.0382422 -0.039141 -0.315443  0.2253384
## 1886   0.4687718  0.291326 -0.272077  0.0447998
## 1896  -0.6074130  0.332337 -0.110106 -0.4160741
## 1906   0.2052294 -0.118447 -0.415039 -0.1007114
## 19113 -0.2106011 -0.110402 -0.050618  0.4214314
## 19210  0.4687718  0.291326 -0.272077  0.0447998
## 1936  -0.4540341 -0.380556 -0.114561  0.4188853
## 1946  -0.0533261 -0.540831 -0.372006 -0.3175786
## 1956  -0.0262933 -0.232838  0.489756 -0.1500159
## 1966  -0.2248056 -0.296927  0.076615  0.1535249
## 1976   0.1368685 -0.244191 -0.277050 -0.2092430
## 1986  -0.1285165  0.277609  0.266896  0.7561338
## 1996   0.1372999 -0.148922 -1.128234  0.1352500
## 2006   0.1472991  0.086470  0.139353  0.1255843
## 20113  0.4857932  0.194441  0.847368 -0.3946953
## 20210 -0.4646733 -0.609948 -0.593006  0.2392230
## 2036  -0.4394038  0.362986  0.401916 -0.0004250
## 2046  -0.1187882 -0.016510  0.438985  0.2943001
## 2056   0.0883657 -0.333407 -0.179145 -0.2862474
## 2066   0.2350444 -0.138594  0.199711 -0.3262723
## 2076  -0.8472788  0.951773  0.242660 -0.8849410
## 2086   0.1974227 -0.207796  0.275651 -0.3860015
## 2096   0.0204362 -0.363882 -0.892340 -0.0502860
## 21012  0.7195206  0.624362  0.375580 -0.0236232
## 21113 -0.0296242 -0.012898  0.357565  0.1905044
## 21211 -0.2350268 -0.315728  0.097247  0.1372974
## 2139  -0.3472617 -0.049764  0.033510  0.6817439
## 2146  -0.1740982  0.107819  0.411717  0.5522969
## 2156   0.1666835 -0.264338  0.337700 -0.4348039
## 2166  -0.6569134  0.677186  0.327085 -0.3254738
## 2176  -0.2337481  0.084045  0.479310  0.5890653
## 2186  -0.1663668 -0.029037 -0.139907  0.4916590
## 2196  -0.1239746 -0.186447  0.548015  0.0407110
## 2206  -0.0781270 -0.102114  0.455470  0.1135000
## 22113 -0.0357573  0.136218  0.271384  0.4261223
## 22210  0.1666835 -0.264338  0.337700 -0.4348039
## 2236   0.7195206  0.624362  0.375580 -0.0236232
## 2246   0.0883657 -0.333407 -0.179145 -0.2862474
## 2256   0.7195206  0.624362  0.375580 -0.0236232
```

```
## 2266   0.2350444 -0.138594  0.199711 -0.3262723
## 2276   0.1849208  0.155672  0.063412  0.1853136
## 2286   0.0680571 -0.059288  0.299306 -0.0002225
## 2296  -0.3543340  1.042570 -0.199756 -0.6174911
## 2306   0.3519081  0.076366 -0.036183 -0.1407362
## 23113  0.4687718  0.291326 -0.272077  0.0447998
## 23210  0.3220931  0.096513 -0.650932  0.0848247
## 2336  -0.0925531  0.156161  0.309579  0.5262638
## 2346  -0.0431193 -0.037721  0.384806  0.1690793
## 2356   0.2835472 -0.049378  0.101806 -0.2492679
## 2366   0.4687718  0.291326 -0.272077  0.0447998
## 2376   0.0089217  0.132993 -0.395173  0.5245970
## 2386   0.3220931  0.096513 -0.650932  0.0848247
## 2396  -0.1365518 -0.049185  0.474842  0.2660981
## 2406   0.7195206  0.624362  0.375580 -0.0236232
## 24112 -0.1824360 -0.058595 -0.107471  0.4661471
## 2429   0.0188787  0.076319  0.259661  0.2675089
## 2435   0.2041032  0.417023 -0.114222  0.5615765
## 2445  -0.0556138 -0.060703  0.410026  0.1492426
## 2455  -0.0840653 -0.597373 -0.309958 -0.3663809
## 2465   0.1181807 -0.353554  0.435604 -0.5118083
## 2475   0.0011150  0.043644  0.295517  0.2393068
## 2485   0.0507440 -0.402609 -0.103204 -0.3459767
## 2495   0.3188059  0.273747  0.946963 -0.0686454
## 2505   0.4687718  0.291326 -0.272077  0.0447998
## 25112  0.0507440 -0.402609 -0.103204 -0.3459767
## 2529  -0.0301187 -0.164885 -0.177454  0.1168068
## 2533   0.4687718  0.291326 -0.272077  0.0447998
## 2543   0.4687718  0.291326 -0.272077  0.0447998
## 2553   0.3220931  0.096513 -0.650932  0.0848247
## 2563   0.0507440 -0.402609 -0.103204 -0.3459767
## 2573   0.0200049 -0.459151 -0.041156 -0.3947790
## 2583  -0.0003037 -0.185032  0.437295 -0.1087541
## 2593   0.4687718  0.291326 -0.272077  0.0447998
## 2603   0.1666835 -0.264338  0.337700 -0.4348039
## 26110  0.1011593 -0.256669 -0.683841 -0.0723133
## 2627   0.2835472 -0.049378  0.101806 -0.2492679
## 2633   0.1974227 -0.207796  0.275651 -0.3860015
## 2643   0.0883657 -0.333407 -0.179145 -0.2862474
## 2653  -0.2784965 -0.395687  0.184992  0.0682838
## 2663   0.1011593 -0.256669 -0.683841 -0.0723133
## 2673   0.4687718  0.291326 -0.272077  0.0447998
## 2683  -0.0431193 -0.037721  0.384806  0.1690793
## 2693   0.3017845  0.370632 -0.172482  0.3708496
## 2703  -0.0494822 -0.049425  0.397650  0.1589772
## 27110  0.1406939 -0.312143  0.390161 -0.4760657
## 2727   0.0006205 -0.108343 -0.239502  0.1656092
## 2733  -1.1591586  0.633509 -0.705857 -0.6319156
## 2743   0.4687718  0.291326 -0.272077  0.0447998
## 2753   0.4687718  0.291326 -0.272077  0.0447998
## 2763   0.1165599  0.029928  0.201401  0.0767819
## 2773   0.4687718  0.291326 -0.272077  0.0447998
```

```
## 2783  -0.4270005 -0.330831 -0.169129  0.4618046
## 2793   0.0680571 -0.059288  0.299306 -0.0002225
## 2803  -0.0556138 -0.060703  0.410026  0.1492426
## 28110  0.0507440 -0.402609 -0.103204 -0.3459767
## 2827  -0.0970608 -0.061952 -0.181243  0.3563361
## 2833   0.0200049 -0.459151 -0.041156 -0.3947790
## 2842  -0.4198201 -0.561164 -0.380054  0.1877228
## 2853  -0.1278000 -0.118494 -0.119195  0.3075337
## 2863  -0.1826917 -0.392324 -0.348352  0.0682005
## 2873   0.1666835 -0.264338  0.337700 -0.4348039
## 2883  -0.0157044 -0.471629 -0.447947 -0.2578493
## 2893  -0.3791134  0.445002  0.311665  0.2470847
## 2903  -0.2226010  0.018602  0.509622  0.4752924
## 29110 -0.2248056 -0.296927  0.076615  0.1535249
## 2927  -0.0594391  0.007250 -0.257184  0.4160653
## 2933  -0.0157044 -0.471629 -0.447947 -0.2578493
## 2943  -0.6862372  0.507053 -0.204729 -0.8715339
## 2953   0.0200049 -0.459151 -0.041156 -0.3947790
## 2963   0.4687718  0.291326 -0.272077  0.0447998
## 2973   0.3017845  0.370632 -0.172482  0.3708496
## 2983   0.1974227 -0.207796  0.275651 -0.3860015
## 2993   0.1406939 -0.312143  0.390161 -0.4760657
## 3002  -0.0358243  0.260508  0.195070  0.6163280
## 30110  0.4687718  0.291326 -0.272077  0.0447998
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_marmots1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), xlim=c
(-3.5,3.5), xlab="PC1 = 40%", ylab="PC2 = 27%", cex.axis=2, cex.lab=2)
with(data_marmots, points(test.pca_marmots1, display = "sites", col = col_points, scaling = scl,
pch = 16, cex=2))
g <- vegan::scores(test.pca_marmots1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_marmots <- summary(test.pca_marmots1)

prop_marmots <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:4){
    prop_marmots[j,i+1] <- as.numeric(abs(sum_all_marmots$species[i,j])/sum(abs(sum_all_marmots
$species[i,])))
  }
}

prop_marmots
```

```
##   PC       prim     adult      breed      freq
## 1  1 0.30940066 0.4479398 0.35560660 0.2684198
## 2  2 0.27812375 0.1439812 0.33735223 0.3341632
## 3  3 0.38552483 0.1288843 0.06171224 0.2613823
## 4  4 0.02695076 0.2791946 0.24532893 0.1360348
```

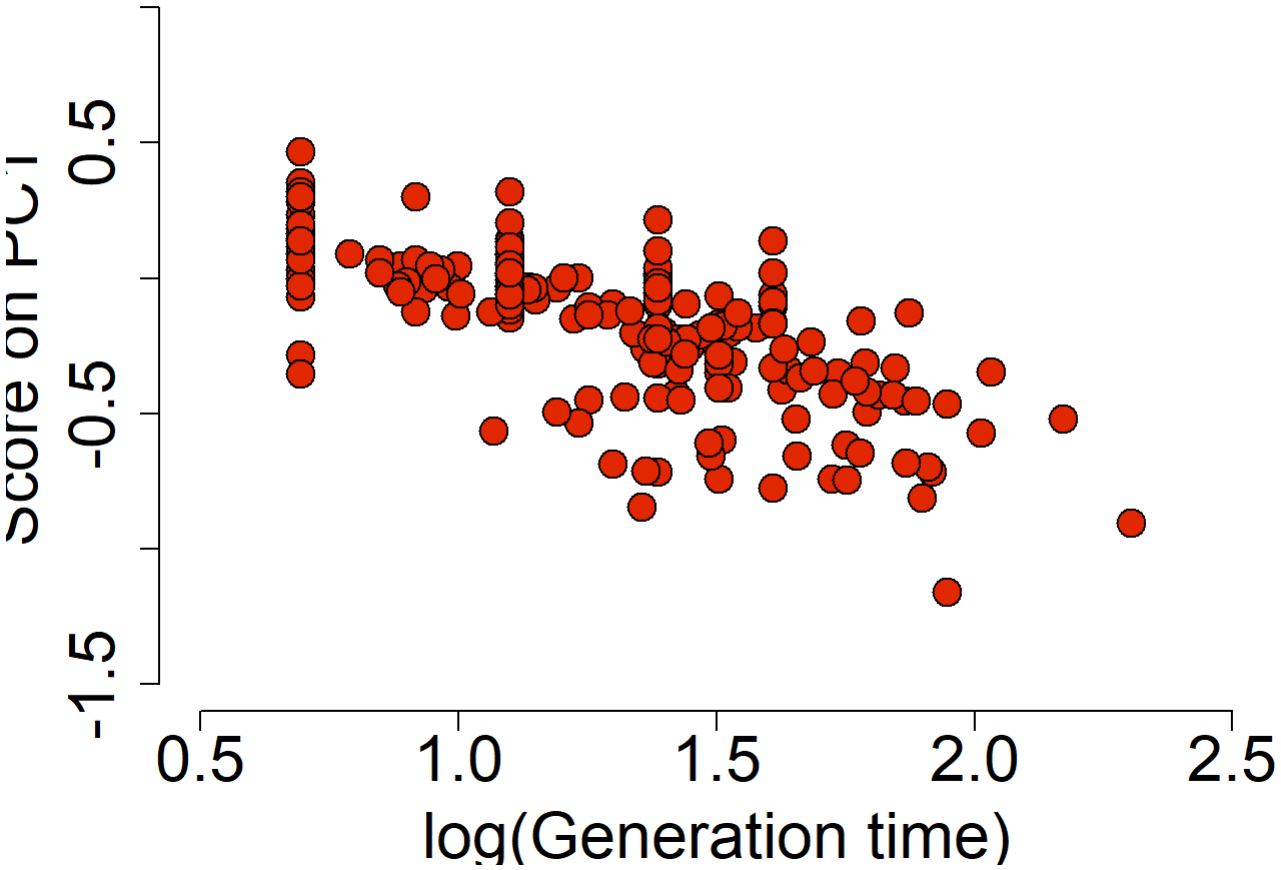
```
# Covariances
test <- as.matrix(scale(log(data_marmots[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult    breed_freq      fec_one
## age_first_repro       1.0000000      0.1766588 -0.1065689812 0.2422620563
## lifetime_adult        0.1766588      1.0000000 -0.4238570847 0.2320096682
## breed_freq           -0.1065690     -0.4238571  1.0000000000 0.0001257311
## fec_one               0.2422621      0.2320097  0.0001257311 1.0000000000
```

```
# Correlation with generation time
individual_score_marmots <- as.numeric(vegan::scores(test.pca_marmots1)$sites[,1])
summary(lm(individual_score_marmots ~ log(data_marmots$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_marmots ~ log(data_marmots$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.67899 -0.10199  0.00677  0.13614  0.47560
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                        0.73519    0.03033   24.24   <2e-16 ***
## log(data_marmots$generation_time) -0.66700    0.02568  -25.97   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1886 on 299 degrees of freedom
## Multiple R-squared:  0.6928, Adjusted R-squared:  0.6918
## F-statistic: 674.4 on 1 and 299 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_marmots$generation_time), individual_score_marmots, pch=21, xlab="log(Generation t
ime)", ylab="Score on PC1", xlim=c(0.5,2.5), ylim=c(-1.5,1), bg=colors[9], cex=2, cex.axis=2, ce
x.lab=2)
```



Great tits

```
data_gtits <- data[which(data$species == "greattits"),]
data_gtits$fec_one <- data_gtits$fecundity +  1
test.pca_gtits1 <- rda(log(data_gtits[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_gtits1)
```

```
##
## Call:
## rda(X = log(data_gtits[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               2          1
## Unconstrained       2          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                           PC1   PC2
## Eigenvalue            1.142 0.858
## Proportion Explained  0.571 0.429
## Cumulative Proportion 0.571 1.000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  6.05029
##
##
## Species scores
##
##                    PC1    PC2
## age_first_repro 0.000  0.000
## lifetime_adult  3.233  2.802
## breed_freq      0.000  0.000
## fec_one         3.233 -2.802
##
##
## Site scores (weighted sums of species scores)
##
##             PC1       PC2
## 1350   0.005924 -0.202586
## 2140  -0.076810 -0.107133
## 3133  -0.442410  0.314676
## 4134   0.316261  0.040053
## 5130   0.005924 -0.202586
## 6130   0.046869 -0.249827
## 7126  -0.114012 -0.064212
## 8126   0.027422 -0.227390
## 9125  -0.159543 -0.011680
## 10125 -0.045356 -0.143423
## 11122  0.027422 -0.227390
## 12109 -0.076810 -0.107133
## 1359  -0.045356 -0.143423
## 1439  -0.076810 -0.107133
## 1540   0.064624 -0.270311
## 1638  -0.114012 -0.064212
## 1739  -0.218243  0.056045
```

```
## 1840   0.027422 -0.227390
## 1930  -0.076810 -0.107133
## 2030   0.027422 -0.227390
## 2147  -0.442410  0.314676
## 2230  -0.300976  0.151498
## 2330  -0.076810 -0.107133
## 2430   0.064624 -0.270311
## 2530   0.027422 -0.227390
## 2628   0.046869 -0.249827
## 2728   0.005924 -0.202586
## 2828   0.064624 -0.270311
## 2928  -0.045356 -0.143423
## 3027  -0.076810 -0.107133
## 3134  -0.018110 -0.174858
## 3227   0.046869 -0.249827
## 3327  -0.018110 -0.174858
## 3427   0.064624 -0.270311
## 3527   0.027422 -0.227390
## 3626  -0.442410  0.314676
## 3726   0.064624 -0.270311
## 3827   0.005924 -0.202586
## 3926  -0.018110 -0.174858
## 4027  -0.114012 -0.064212
## 4135   0.307191  0.050517
## 4227  -0.018110 -0.174858
## 4327  -0.045356 -0.143423
## 4427   0.005924 -0.202586
## 4527   0.477224  0.205724
## 4626   0.027422 -0.227390
## 4726   0.064624 -0.270311
## 4826   0.027422 -0.227390
## 4926   0.242212  0.125486
## 5026  -0.114012 -0.064212
## 5133   0.471476  0.212356
## 5226  -0.300976  0.151498
## 5326   0.080956 -0.289155
## 5426   0.005924 -0.202586
## 5526   0.135694 -0.352308
## 5626   0.096077 -0.306601
## 5726  -0.076810 -0.107133
## 5826   0.410823  0.282333
## 5926   0.266245  0.097758
## 6026  -0.300976  0.151498
## 6133  -0.442410  0.314676
## 6225   0.027422 -0.227390
## 6325   0.502534  0.425831
## 6425  -0.442410  0.314676
## 6524   0.110155 -0.322843
## 6624   0.214966  0.156922
## 6724  -0.045356 -0.143423
## 6824   0.080956 -0.289155
## 6924  -0.159543 -0.011680
```

```
## 7022   0.110155 -0.322843
## 7127   0.165758  0.213695
## 7222   0.046869 -0.249827
## 7322   0.080956 -0.289155
## 7422   0.027422 -0.227390
## 7522   0.135694 -0.352308
## 7622  -0.182088  0.615021
## 7722   0.254582  0.111214
## 7822  -0.018110 -0.174858
## 7922   0.046869 -0.249827
## 8022   0.046869 -0.249827
## 8127  -0.018110 -0.174858
## 8220   0.425944  0.264887
## 8322   0.110155 -0.322843
## 8422   0.027422 -0.227390
## 8520   0.080956 -0.289155
## 8622   0.027422 -0.227390
## 8720  -0.442410  0.314676
## 8822   0.027422 -0.227390
## 8922   0.123324 -0.338036
## 9022   0.385133  0.561281
## 9126  -0.076810 -0.107133
## 9220  -0.300976  0.151498
## 9320  -0.018110 -0.174858
## 9419   0.489365  0.441025
## 9519   0.242212  0.125486
## 9619  -0.045356 -0.143423
## 9720  -0.442410  0.314676
## 9820   0.324127  0.382358
## 9920   0.005924 -0.202586
## 10020 -0.045356 -0.143423
## 10126  0.005924 -0.202586
## 10220  0.100779  0.288664
## 10320  0.460166  0.474713
## 10420  0.124812  0.260936
## 10520 -0.114012 -0.064212
## 10620  0.229043  0.140680
## 10720  0.446712  0.240926
## 10820  0.269389  0.445511
## 10919  0.005924 -0.202586
## 11019  0.005924 -0.202586
## 11123  0.110155 -0.322843
## 11219  0.005924 -0.202586
## 11318 -0.076810 -0.107133
## 11419 -0.114012 -0.064212
## 11519  0.042079  0.356389
## 11619  0.514904  0.411559
## 11719  0.287743  0.072955
## 11819 -0.114012 -0.064212
## 11919 -0.442410  0.314676
## 12019 -0.018110 -0.174858
## 12119 -0.159543 -0.011680
```

```
## 12219 -0.045356 -0.143423
## 12319 -0.114012 -0.064212
## 12418 -0.076810 -0.107133
## 12518  0.520819  0.404735
## 12618  0.027422 -0.227390
## 12718  0.005924 -0.202586
## 12818  0.183512  0.193211
## 12916  0.078234  0.915365
## 13013 -0.442410  0.314676
## 13115  0.402820  0.291567
## 13213 -0.076810 -0.107133
## 13311  0.110155 -0.322843
## 13410  0.027422 -0.227390
## 13510  0.418524  0.273449
## 1369   0.346822  0.356173
## 1379  -0.218243  0.056045
## 1389  -0.159543 -0.011680
## 1399   0.520819  0.404735
## 1409  -0.045356 -0.143423
## 14115  0.027422 -0.227390
## 14212  0.183512  0.193211
## 14310 -0.159543 -0.011680
## 1449   0.096077 -0.306601
## 1459   0.277277  0.085030
## 1469  -0.018110 -0.174858
## 1479  -0.182088  0.615021
## 1489   0.110155 -0.322843
## 1499  -0.442410  0.314676
## 1509  -0.159543 -0.011680
## 15115 -0.442410  0.314676
## 15212  0.124812  0.260936
## 15310 -0.442410  0.314676
## 1549  -0.159543 -0.011680
## 1558  -0.442410  0.314676
## 1569  -0.076810 -0.107133
## 1579  -0.442410  0.314676
## 1589   0.410823  0.282333
## 1598   0.376736  0.321661
## 1609  -0.300976  0.151498
## 16115 -0.159543 -0.011680
## 16212 -0.300976  0.151498
## 1639   0.183512  0.193211
## 1649   0.311757  0.396630
## 1659  -0.442410  0.314676
## 1669  -0.182088  0.615021
## 1679  -0.442410  0.314676
## 1689  -0.076810 -0.107133
## 1699   0.005924 -0.202586
## 1709  -0.300976  0.151498
## 17115 -0.114012 -0.064212
## 17212 -0.018110 -0.174858
## 17310  0.357289  0.344098
```

```
## 1749  -0.076810 -0.107133
## 1759  -0.442410  0.314676
## 1769  -0.442410  0.314676
## 1779  -0.029810  0.790711
## 1789  -0.442410  0.314676
## 1799  -0.076810 -0.107133
## 1808   0.277277  0.085030
## 18115  0.287743  0.072955
## 18212 -0.045356 -0.143423
## 18310  0.242212  0.125486
## 1849   0.027422 -0.227390
## 1859   0.073532  0.320100
## 1869   0.287743  0.072955
## 1878   0.266245  0.097758
## 1887   0.165758  0.213695
## 1897  -0.300976  0.151498
## 1907  -0.045356 -0.143423
## 19114  0.046869 -0.249827
## 19211 -0.442410  0.314676
## 1937  -0.076810 -0.107133
## 1947  -0.442410  0.314676
## 1957  -0.018110 -0.174858
## 1967  -0.045356 -0.143423
## 1977  -0.045356 -0.143423
## 1987  -0.076810 -0.107133
## 1997  -0.076810 -0.107133
## 2007   0.005924 -0.202586
## 20114  0.027422 -0.227390
## 20211 -0.114012 -0.064212
## 2037   0.287743  0.072955
## 2047  -0.045356 -0.143423
## 2057  -0.018110 -0.174858
## 2067   0.004877  0.399311
## 2077  -0.218243  0.056045
## 2087  -0.018110 -0.174858
## 2097  -0.076810 -0.107133
## 21013  0.005924 -0.202586
## 21114 -0.218243  0.056045
## 21212  0.005924 -0.202586
## 21310  0.005924 -0.202586
## 2148  -0.300976  0.151498
## 2157   0.027422 -0.227390
## 2167   0.005924 -0.202586
## 2177   0.005924 -0.202586
## 2187   0.253057  0.464355
## 2197   0.254582  0.111214
## 2207   0.005924 -0.202586
## 22114  0.005924 -0.202586
## 22211 -0.442410  0.314676
## 2237   0.046869 -0.249827
## 2247   0.046869 -0.249827
## 2257   0.027422 -0.227390
```

```
## 2267   0.046869 -0.249827
## 2277  -0.018110 -0.174858
## 2287   0.214966  0.156922
## 2297   0.005924 -0.202586
## 2307   0.005924 -0.202586
## 23114  0.346822  0.356173
## 23211  0.254582  0.111214
## 2337   0.266245  0.097758
## 2347   0.254582  0.111214
## 2357  -0.076810 -0.107133
## 2367   0.005924 -0.202586
## 2377   0.027422 -0.227390
## 2387  -0.045356 -0.143423
## 2397  -0.159543 -0.011680
## 2407  -0.045356 -0.143423
## 24113 -0.018110 -0.174858
## 24210 -0.018110 -0.174858
## 2436  -0.076810 -0.107133
## 2446  -0.442410  0.314676
## 2456  -0.018110 -0.174858
## 2466  -0.442410  0.314676
## 2476   0.005924 -0.202586
## 2486  -0.159543 -0.011680
## 2496   0.005924 -0.202586
## 2506   0.005924 -0.202586
## 25113 -0.018110 -0.174858
## 25210  0.064624 -0.270311
## 2534  -0.018110 -0.174858
## 2544   0.005924 -0.202586
## 2554   0.046869 -0.249827
## 2564  -0.114012 -0.064212
## 2574  -0.442410  0.314676
## 2584   0.064624 -0.270311
## 2594   0.214966  0.156922
## 2604   0.046869 -0.249827
## 26111  0.046869 -0.249827
## 2629  -0.159543 -0.011680
## 2634  -0.076810 -0.107133
## 2644  -0.442410  0.314676
## 2654  -0.114012 -0.064212
## 2664   0.027422 -0.227390
## 2674  -0.018110 -0.174858
## 2684   0.027422 -0.227390
## 2694  -0.045356 -0.143423
## 2704  -0.018110 -0.174858
## 27111  0.297699  0.061469
## 2729   0.046869 -0.249827
## 2734  -0.018110 -0.174858
## 2744  -0.300976  0.151498
## 2754  -0.018110 -0.174858
## 2764   0.027422 -0.227390
## 2774  -0.442410  0.314676
```

```
## 2784  -0.159543 -0.011680
## 2794  -0.159543 -0.011680
## 2804   0.005924 -0.202586
## 28111  0.027422 -0.227390
## 2829   0.046869 -0.249827
## 2834   0.619245  0.484555
## 2843   0.005924 -0.202586
## 2854  -0.045356 -0.143423
## 2864   0.080956 -0.289155
## 2874   0.005924 -0.202586
## 2884  -0.018110 -0.174858
## 2894  -0.018110 -0.174858
## 2904  -0.159543 -0.011680
## 29111  0.005924 -0.202586
## 2929   0.027422 -0.227390
## 2934   0.027422 -0.227390
## 2944  -0.076810 -0.107133
## 2954  -0.442410  0.314676
## 2964   0.005924 -0.202586
## 2974   0.005924 -0.202586
## 2984   0.027422 -0.227390
## 2994  -0.300976  0.151498
## 3003  -0.045356 -0.143423
## 30111 -0.018110 -0.174858
## 3028   0.005924 -0.202586
## 3033   0.316261  0.040053
## 3043   0.046869 -0.249827
## 3053  -0.018110 -0.174858
## 3063  -0.218243  0.056045
## 3073   0.027422 -0.227390
## 3082   0.027422 -0.227390
## 3093  -0.045356 -0.143423
## 31010 -0.300976  0.151498
## 31110  0.046869 -0.249827
## 31210 -0.076810 -0.107133
## 3135  -0.182088  0.615021
## 3143  -0.114012 -0.064212
## 3153  -0.076810 -0.107133
## 3163   0.601599  0.311535
## 3173   0.229043  0.140680
## 3183   0.046869 -0.249827
## 3193   0.440022  0.248645
## 3203   0.165758  0.213695
## 32110 -0.018110 -0.174858
## 3228  -0.442410  0.314676
## 3233   0.266245  0.097758
## 3243  -0.218243  0.056045
## 3253  -0.114012 -0.064212
## 3263   0.005924 -0.202586
## 3273   0.333275  0.020423
## 3283   0.064624 -0.270311
## 3293   0.214966  0.156922
```

```
## 3303   0.465561  0.219180
## 33110  0.027422 -0.227390
## 3328   0.005924 -0.202586
## 3333  -0.045356 -0.143423
## 3343  -0.114012 -0.064212
## 3352  -0.018110 -0.174858
## 3363   0.418524  0.273449
## 3373   0.027422 -0.227390
## 3383  -0.442410  0.314676
## 3393  -0.114012 -0.064212
## 3403   0.027422 -0.227390
## 34110  0.254582  0.111214
## 3428  -0.018110 -0.174858
## 3433  -0.442410  0.314676
## 3443  -0.076810 -0.107133
## 3453  -0.442410  0.314676
## 3463   0.027422 -0.227390
## 3473   0.046869 -0.249827
## 3483   0.046869 -0.249827
## 3493  -0.076810 -0.107133
## 3503  -0.018110 -0.174858
## 35110  0.183512  0.193211
## 3528  -0.045356 -0.143423
## 3533   0.046869 -0.249827
## 3543  -0.045356 -0.143423
## 3553   0.005924 -0.202586
## 3563  -0.218243  0.056045
## 3573   0.005924 -0.202586
## 3583   0.254582  0.111214
## 3593  -0.045356 -0.143423
## 3603  -0.218243  0.056045
## 36110 -0.018110 -0.174858
## 3627  -0.114012 -0.064212
## 3633   0.080956 -0.289155
## 3643  -0.018110 -0.174858
## 3653  -0.045356 -0.143423
## 3663  -0.045356 -0.143423
## 3673  -0.076810 -0.107133
## 3683  -0.442410  0.314676
## 3693  -0.018110 -0.174858
## 3703  -0.018110 -0.174858
## 37110 -0.045356 -0.143423
## 3727  -0.442410  0.314676
## 3733  -0.442410  0.314676
## 3743  -0.442410  0.314676
## 3753   0.080956 -0.289155
## 3763   0.005924 -0.202586
## 3773   0.335790  0.368902
## 3783   0.298588  0.411823
## 3793   0.214966  0.156922
## 3803   0.376736  0.321661
## 38110  0.199844  0.174368
```

```
## 3828   0.027422 -0.227390
## 3833  -0.442410  0.314676
## 3843   0.453191  0.233452
## 3853   0.357289  0.344098
## 3863  -0.218243  0.056045
## 3873  -0.114012 -0.064212
## 3883   0.080956 -0.289155
## 3893  -0.076810 -0.107133
## 3903  -0.159543 -0.011680
## 39110 -0.159543 -0.011680
## 3927  -0.442410  0.314676
## 3933  -0.114012 -0.064212
## 3943  -0.076810 -0.107133
## 3953  -0.159543 -0.011680
## 3963  -0.045356 -0.143423
## 3973   0.027422 -0.227390
## 3983  -0.045356 -0.143423
## 3993  -0.159543 -0.011680
## 4003  -0.040655  0.451842
## 40110 -0.045356 -0.143423
## 4028   0.165758  0.213695
## 4033  -0.442410  0.314676
## 4043  -0.159543 -0.011680
## 4053  -0.300976  0.151498
## 4063   0.324127  0.382358
## 4073  -0.076810 -0.107133
## 4083   0.146310  0.236133
## 4093   0.004877  0.399311
## 41010 -0.442410  0.314676
## 41110 -0.442410  0.314676
## 41210 -0.442410  0.314676
## 4136  -0.159543 -0.011680
## 4142  -0.218243  0.056045
## 4153  -0.182088  0.615021
## 4162   0.046869 -0.249827
## 4173  -0.159543 -0.011680
## 4183  -0.076810 -0.107133
## 4193   0.143077  0.591243
## 4203  -0.442410  0.314676
## 42110 -0.018110 -0.174858
## 4228  -0.442410  0.314676
## 4233  -0.442410  0.314676
## 4243  -0.114012 -0.064212
## 4253  -0.442410  0.314676
## 4263  -0.442410  0.314676
## 4273  -0.442410  0.314676
## 4283   0.027422 -0.227390
## 4293  -0.442410  0.314676
## 4303  -0.442410  0.314676
## 43110 -0.159543 -0.011680
## 4328   0.046869 -0.249827
## 4333  -0.114012 -0.064212
```

```
## 4343  -0.045356 -0.143423
## 4353  -0.218243  0.056045
## 4363   0.005924 -0.202586
## 4373  -0.442410  0.314676
## 4383  -0.300976  0.151498
## 4393   0.027422 -0.227390
## 4403  -0.045356 -0.143423
## 44110  0.199844  0.174368
## 4428   0.254582  0.111214
## 4433   0.005924 -0.202586
## 4443  -0.018110 -0.174858
## 4453  -0.114012 -0.064212
## 4463  -0.018110 -0.174858
## 4473  -0.045356 -0.143423
## 4483  -0.442410  0.314676
## 4493  -0.159543 -0.011680
## 4503  -0.076810 -0.107133
## 45110 -0.114012 -0.064212
## 4528   0.183512  0.193211
## 4533   0.348978  0.002305
## 4543   0.341278  0.011190
## 4553  -0.159543 -0.011680
## 4563  -0.300976  0.151498
## 4573  -0.442410  0.314676
## 4583  -0.114012 -0.064212
## 4593  -0.182088  0.615021
## 4603  -0.442410  0.314676
## 46110 -0.018110 -0.174858
## 4627  -0.045356 -0.143423
## 4633   0.027422 -0.227390
## 4643   0.005924 -0.202586
## 4653  -0.045356 -0.143423
## 4663   0.064624 -0.270311
## 4673   0.096077 -0.306601
## 4683  -0.076810 -0.107133
## 4693  -0.018110 -0.174858
## 4703  -0.045356 -0.143423
## 47110  0.453191  0.233452
## 4727  -0.018110 -0.174858
## 4733   0.297699  0.061469
## 4743  -0.114012 -0.064212
## 4752   0.254582  0.111214
## 4763  -0.018110 -0.174858
## 4773  -0.045356 -0.143423
## 4783  -0.018110 -0.174858
## 4793  -0.159543 -0.011680
## 4803  -0.018110 -0.174858
## 48110 -0.018110 -0.174858
## 4827   0.277277  0.085030
## 4833   0.135694 -0.352308
## 4843   0.168855 -0.390568
## 4853   0.527240  0.148018
```

```
## 4863  -0.442410  0.314676
## 4873   0.027422 -0.227390
## 4883   0.046869 -0.249827
## 4893   0.471476  0.212356
## 4903   0.396016 -0.051964
## 49110  0.027422 -0.227390
## 4927   0.046869 -0.249827
## 4933   0.394490  0.301177
## 4943   0.027422 -0.227390
## 4953   0.513479  0.163895
## 4963  -0.018110 -0.174858
## 4973  -0.076810 -0.107133
## 4983   0.005924 -0.202586
## 4993  -0.018110 -0.174858
## 5003   0.005924 -0.202586
## 50110  0.064624 -0.270311
## 5027   0.080956 -0.289155
## 5033   0.046869 -0.249827
## 5043  -0.018110 -0.174858
## 5053   0.064624 -0.270311
## 5063   0.064624 -0.270311
## 5073   0.229043  0.140680
## 5083   0.046869 -0.249827
## 5093   0.027422 -0.227390
## 51010  0.046869 -0.249827
## 51110  0.199844  0.174368
## 51210 -0.018110 -0.174858
## 5134   0.005924 -0.202586
## 5143  -0.300976  0.151498
## 5153  -0.218243  0.056045
## 5163   0.418524  0.273449
## 5173   0.493556  0.186880
## 5183   0.266245  0.097758
## 5193  -0.442410  0.314676
## 5203  -0.442410  0.314676
## 52110 -0.018110 -0.174858
## 5227   0.383645 -0.037692
## 5233  -0.076810 -0.107133
## 5243   0.242212  0.125486
## 5253  -0.114012 -0.064212
## 5263  -0.114012 -0.064212
## 5273   0.333275  0.020423
## 5283  -0.159543 -0.011680
## 5293   0.080956 -0.289155
## 5303   0.277277  0.085030
## 53110 -0.045356 -0.143423
## 5327   0.277277  0.085030
## 5333  -0.018110 -0.174858
## 5343   0.073532  0.320100
## 5353   0.046869 -0.249827
## 5363  -0.018110 -0.174858
## 5372   0.316261  0.040053
```

```
## 5383   0.297699  0.061469
## 5393   0.027422 -0.227390
## 5403   0.254582  0.111214
## 54110 -0.018110 -0.174858
## 5427  -0.018110 -0.174858
## 5433   0.452163  0.483946
## 5443   0.453191  0.233452
## 5452  -0.076810 -0.107133
## 5463   0.027422 -0.227390
## 5473   0.005924 -0.202586
## 5483   0.073532  0.320100
## 5493  -0.018110 -0.174858
## 5503  -0.076810 -0.107133
## 55110  0.146310  0.236133
## 5527  -0.045356 -0.143423
## 5533  -0.045356 -0.143423
## 5543  -0.018110 -0.174858
## 5553   0.307191  0.050517
## 5563  -0.442410  0.314676
## 5573   0.425944  0.264887
## 5583   0.535924  0.137999
## 5593   0.502534  0.425831
## 5603   0.426079  0.514040
## 56110  0.277277  0.085030
## 5627   0.046869 -0.249827
## 5633   0.064624 -0.270311
## 5643  -0.218243  0.056045
## 5653  -0.018110 -0.174858
## 5663  -0.076810 -0.107133
## 5673  -0.076810 -0.107133
## 5683  -0.018110 -0.174858
## 5693   0.410823  0.282333
## 5703  -0.045356 -0.143423
## 57110 -0.442410  0.314676
## 5727  -0.018110 -0.174858
## 5733   0.693426  0.556971
## 5743   0.311757  0.396630
## 5753  -0.018110 -0.174858
## 5763  -0.442410  0.314676
## 5773  -0.218243  0.056045
## 5783  -0.442410  0.314676
## 5793   0.376736  0.321661
## 5803   0.508813  0.418587
## 58110 -0.218243  0.056045
## 5827   0.376736  0.321661
## 5833  -0.045356 -0.143423
## 5843   0.287743  0.072955
## 5853  -0.114012 -0.064212
## 5863   0.183512  0.193211
## 5873  -0.018110 -0.174858
## 5883  -0.159543 -0.011680
## 5893  -0.018110 -0.174858
```

```
## 5903   0.266245  0.097758
## 59110 -0.099355  0.519567
## 5927   0.367244  0.332612
## 5933   0.367244  0.332612
## 5943   0.124812  0.260936
## 5953   0.027422 -0.227390
## 5963   0.183512  0.193211
## 5973   0.064624 -0.270311
## 5983   0.367244  0.332612
## 5993  -0.114012 -0.064212
## 6003   0.100779  0.288664
## 60110 -0.114012 -0.064212
## 6027  -0.300976  0.151498
## 6033   0.215855  0.507276
## 6043   0.446712  0.240926
## 6053  -0.442410  0.314676
## 6063  -0.114012 -0.064212
## 6073   0.548065  0.373300
## 6083  -0.076810 -0.107133
## 6093   0.453191  0.233452
## 61010  0.537599  0.385375
## 61110 -0.159543 -0.011680
## 61210  0.425944  0.264887
## 6134   0.316261  0.040053
## 6143  -0.218243  0.056045
## 6153   0.005924 -0.202586
## 6163  -0.114012 -0.064212
## 6173  -0.045356 -0.143423
## 6183   0.394490  0.301177
## 6193  -0.442410  0.314676
## 6203   0.459469  0.226208
## 62110 -0.018110 -0.174858
## 6226   0.440022  0.248645
## 6233  -0.076810 -0.107133
## 6243   0.346822  0.356173
## 6253  -0.159543 -0.011680
## 6263  -0.300976  0.151498
## 6273  -0.076810 -0.107133
## 6283   0.064624 -0.270311
## 6293  -0.040655  0.451842
## 6303   0.376736  0.321661
## 63110  0.433104  0.256626
## 6326   0.440022  0.248645
## 6333  -0.442410  0.314676
## 6343  -0.045356 -0.143423
## 6353  -0.114012 -0.064212
## 6363   0.046869 -0.249827
## 6373   0.214966  0.156922
## 6383   0.046869 -0.249827
## 6393  -0.442410  0.314676
## 6403  -0.018110 -0.174858
## 64110  0.046869 -0.249827
```

```
## 6426  -0.114012 -0.064212
## 6433  -0.442410  0.314676
## 6443   0.046869 -0.249827
## 6453  -0.045356 -0.143423
## 6463   0.005924 -0.202586
## 6473  -0.018110 -0.174858
## 6483  -0.018110 -0.174858
## 6493  -0.218243  0.056045
## 6503  -0.218243  0.056045
## 65110 -0.114012 -0.064212
## 6525   0.027422 -0.227390
## 6533  -0.300976  0.151498
## 6542  -0.159543 -0.011680
## 6553  -0.018110 -0.174858
## 6563  -0.218243  0.056045
## 6573   0.459469  0.226208
## 6583  -0.045356 -0.143423
## 6593   0.123324 -0.338036
## 6603  -0.045356 -0.143423
## 66110  0.183512  0.193211
## 6625  -0.045356 -0.143423
## 6633   0.333275  0.020423
## 6643   0.005924 -0.202586
## 6653   0.254582  0.111214
## 6663  -0.442410  0.314676
## 6673  -0.018110 -0.174858
## 6683   0.183512  0.193211
## 6693   0.229043  0.140680
## 6703   0.046869 -0.249827
## 67110 -0.442410  0.314676
```

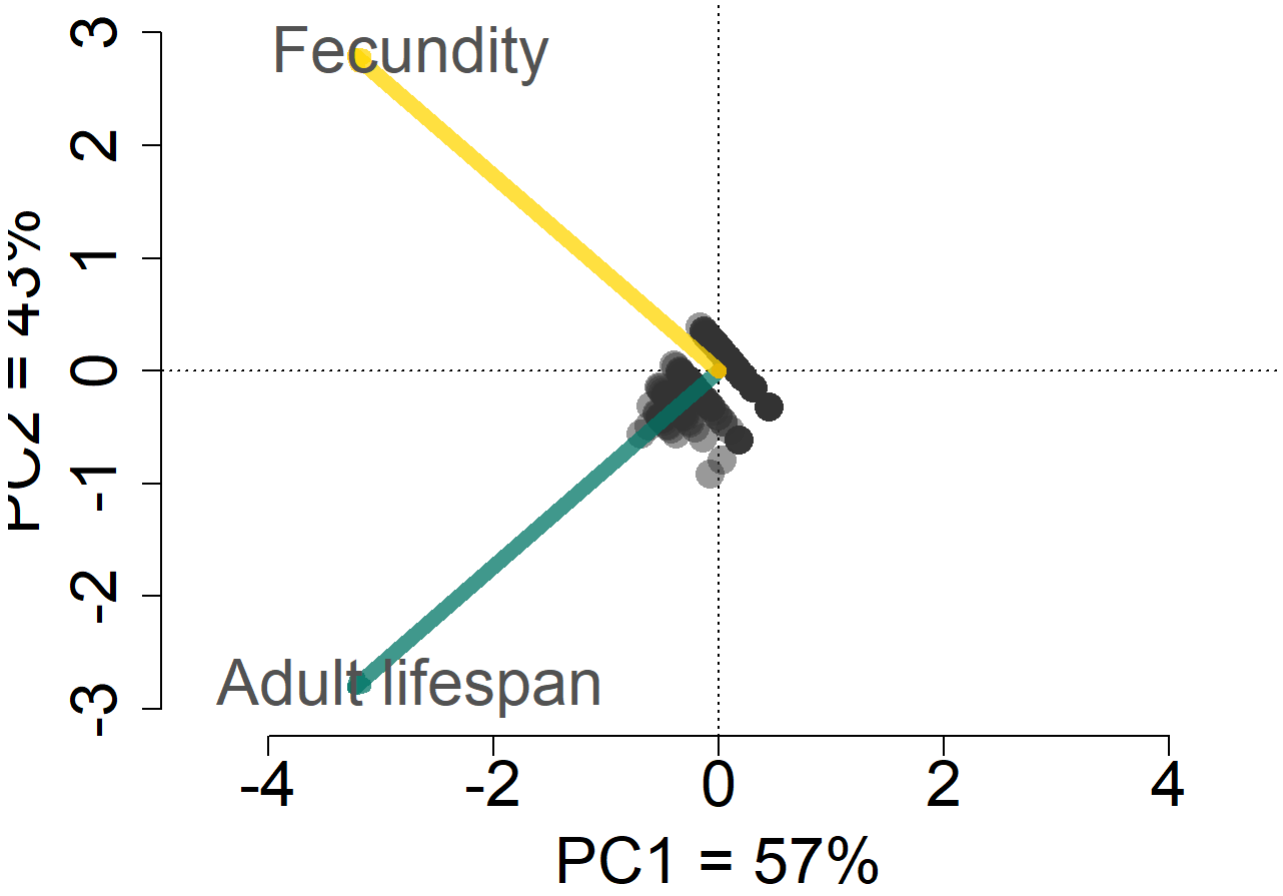
```
# have the scores reversed to have the adult lifespan to the left
test.pca_gtits1_reverse <- test.pca_gtits1
test.pca_gtits1_reverse$CA$u <- -(test.pca_gtits1_reverse$CA$u)
test.pca_gtits1_reverse$CA$v <- -(test.pca_gtits1_reverse$CA$v)

# Figure
par(mfrow=c(1,1), mar=c(4,4,2,2), bty="n")
plot(test.pca_gtits1_reverse,  scaling = scl, choices=c(1,2), type="n",  ylim=c(-3,3), xlim=c(-
3.5,3.5), main="", xlab="PC1 = 57%", ylab="PC2 = 43%", cex.lab=2, cex.axis=2)
with(data_gtits, points(test.pca_gtits1_reverse, display = "sites", col = col_points, scaling =
scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_gtits1_reverse, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
```

```
## Warning in arrows(0, 0, len * g[, 1], len * g[, 2], length = 0.05, col =
## c(col_afr, : zero-length arrow is of indeterminate angle and so skipped

## Warning in arrows(0, 0, len * g[, 1], len * g[, 2], length = 0.05, col =
## c(col_afr, : zero-length arrow is of indeterminate angle and so skipped
```

```
#text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32")
text(x=g[2,1]+0.5, y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
#text(x=g[3,1], y=g[3,2], labels="Breeding frequency", col = "gray32")
text(x=g[4,1]+0.5, y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```



```r
# Test for proportion of variance explained per axe
sum_all_gtits <- summary(test.pca_gtits1)

prop_gtits <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)


for (i in 1:4) {
  for (j in 1:2){
    prop_gtits[j,i+1] <- as.numeric(abs(sum_all_gtits$species[i,j])/sum(abs(sum_all_gtits$specie
s[i,])))
  }
}

prop_gtits
```

```
##   PC prim     adult breed      freq
## 1  1  NaN 0.5356924   NaN 0.5356924
## 2  2  NaN 0.4643076   NaN 0.4643076
## 3  3    3 3.0000000     3 3.0000000
## 4  4    4 4.0000000     4 4.0000000
```

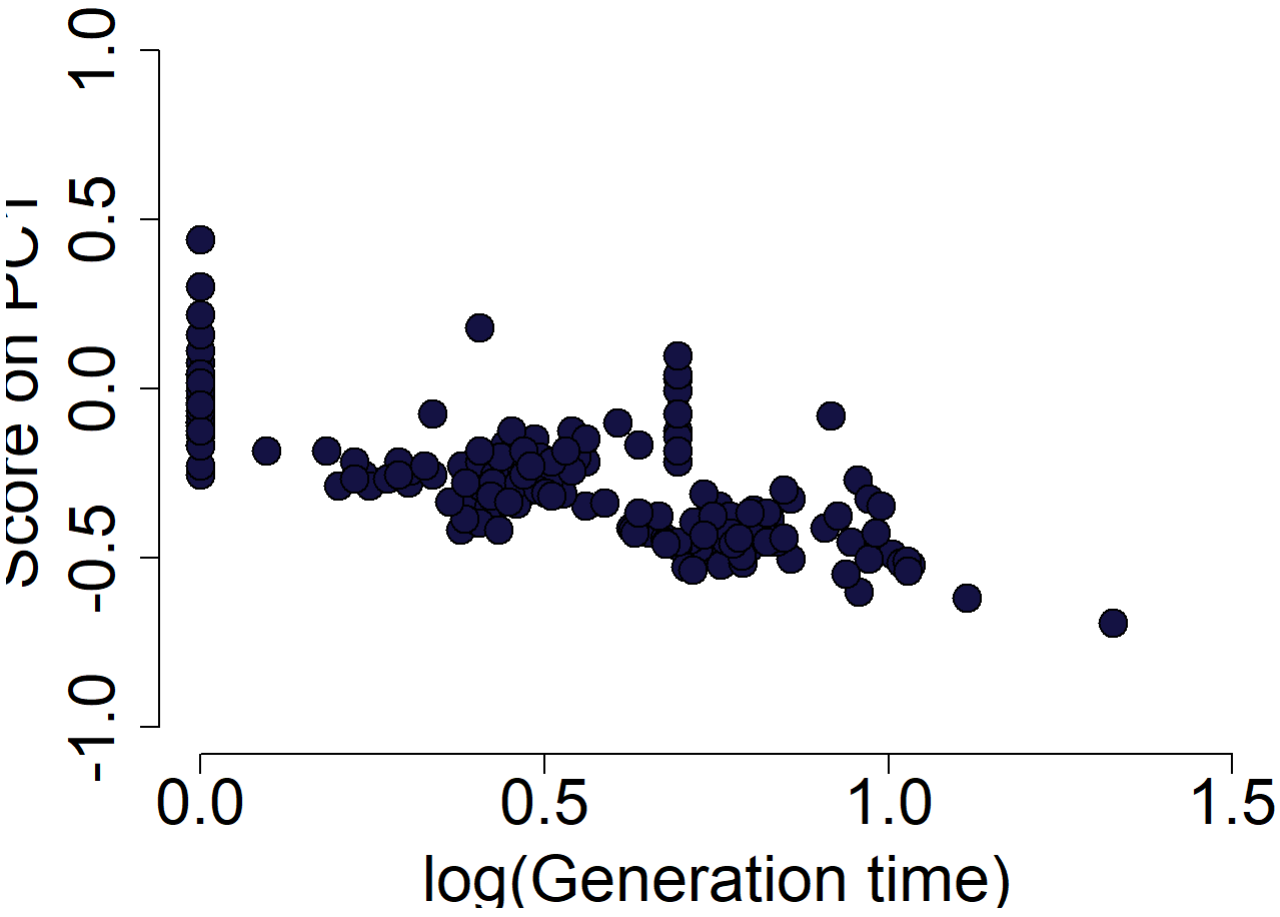
```r
# Covariances
test <- as.matrix(scale(log(data_gtits[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult breed_freq   fec_one
## age_first_repro              NA             NA         NA        NA
## lifetime_adult               NA      1.0000000         NA 0.1420458
## breed_freq                   NA             NA         NA        NA
## fec_one                      NA      0.1420458         NA 1.0000000
```

```r
# Correlation with generation time
individual_score_gtits_reverse <- as.numeric(vegan::scores(test.pca_gtits1_reverse)$sites[,1])
summary(lm(individual_score_gtits_reverse ~ log(data_gtits$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_gtits_reverse ~ log(data_gtits$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.34037 -0.11473 -0.04245  0.05514  0.43580
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                     0.087310   0.006984   12.50   <2e-16 ***
## log(data_gtits$generation_time) -0.611347   0.022383  -27.31   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1608 on 669 degrees of freedom
## Multiple R-squared:  0.5272, Adjusted R-squared:  0.5265
## F-statistic:   746 on 1 and 669 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_gtits$generation_time), individual_score_gtits_reverse, pch=21, xlab="log(Generati
on time)", ylab="Score on PC1", xlim=c(0,1.5), ylim=c(-1,1), bg=colors[7], cex=2, cex.axis=2, ce
x.lab=2)
```



Eurasian oystercatcher

```
data_oystercatcher <- data[which(data$species == "oystercatcher"),]
data_oystercatcher$fec_one <- data_oystercatcher$fecundity +  1
test.pca_oystercatcher1 <- rda(log(data_oystercatcher[,c(2,3,4,7)]), scale=TRUE)
summary(test.pca_oystercatcher1)
```

```
##
## Call:
## rda(X = log(data_oystercatcher[, c(2, 3, 4, 7)]), scale = TRUE)
##
## Partitioning of correlations:
##               Inertia Proportion
## Total               4          1
## Unconstrained       4          1
##
## Eigenvalues, and their contribution to the correlations
##
## Importance of components:
##                            PC1    PC2    PC3    PC4
## Eigenvalue            1.1768 1.1266 0.8853 0.8113
## Proportion Explained  0.2942 0.2817 0.2213 0.2028
## Cumulative Proportion 0.2942 0.5758 0.7972 1.0000
##
## Scaling 2 for species and site scores
## * Species are scaled proportional to eigenvalues
## * Sites are unscaled: weighted dispersion equal on all dimensions
## * General scaling constant of scores:  8.122173
##
##
## Species scores
##
##                     PC1     PC2    PC3     PC4
## age_first_repro  0.6063 -2.9670 2.5279 -0.9652
## lifetime_adult  -2.9144  0.7241 1.9794  1.8858
## breed_freq       3.1179  0.3743 0.8021  2.4470
## fec_one          0.9084  3.0189 1.9102 -1.7043
##
##
## Site scores (weighted sums of species scores)
##
##              PC1        PC2        PC3       PC4
## 1306   0.1260950 -0.7963206  0.7408166 -0.159467
## 2108  -0.2236983  0.1398403  0.1322484  0.193718
## 3107  -0.1269198  0.0073315 -0.0110850  0.286447
## 4108   0.2958442 -0.4512319  0.0706535 -0.208867
## 5107   0.2239395 -0.0837178 -0.3278356 -0.042846
## 6108  -0.0991255  0.0001188 -0.0361773  0.260361
## 7107   0.0295787  0.1741290  0.0532261  0.040457
## 8107  -0.1362083 -0.4166952  0.5637615  0.174715
## 9106   0.0989609 -0.0512854 -0.2150067  0.074451
## 10107 -0.1280996 -0.3093215  0.6649617  0.114790
## 11107 -0.1730470 -0.4938505  0.6231947  0.085027
## 12103  0.0038255 -0.1713851  0.0632100  0.122842
## 1320  -0.4579245 -0.7824400  0.6390139 -0.560269
## 1419  -1.4305361 -0.2042153 -0.6124245 -1.457106
## 1520  -0.3524679 -0.2891698  0.2173096 -0.102979
## 1619  -0.1135577  0.0038640 -0.0231481  0.273906
## 1720  -0.0459566 -0.0333806  0.3612056 -0.319856
```

```
## 1820   0.3908970 -0.9370591  0.5974274 -0.428335
## 1919   0.4506659 -0.6361965  0.1232126 -0.395068
## 2019  -0.0019412 -0.0251009 -0.1239138  0.169150
## 2119  -0.1667581  0.1417856  0.1479109  0.264528
## 2219  -0.0779040  0.1276223  0.0765117  0.176885
## 2319  -0.0480608 -0.0249098  0.2418996  0.107980
## 2419   0.2781043  0.3770328  0.0939196 -0.320568
## 2519  -0.0936503  0.1228139  0.0819103  0.195914
## 2618  -0.3040587 -0.0200207 -0.0882903  0.057047
## 2718   0.2239395 -0.0837178 -0.3278356 -0.042846
## 2818  -0.5928702  0.0107463 -0.1518300 -0.385370
## 2918   0.2239395 -0.0837178 -0.3278356 -0.042846
## 3018   0.2239395 -0.0837178 -0.3278356 -0.042846
## 3118   0.0989609 -0.0512854 -0.2150067  0.074451
## 3218  -0.0260177 -0.0188530 -0.1021779  0.191747
## 3318   0.0279020 -0.1776330  0.0414741  0.100245
## 3418  -0.1269198  0.0073315 -0.0110850  0.286447
## 3518  -0.0662518 -0.0084121 -0.0658552  0.229508
## 3617   0.2781043  0.3770328  0.0939196 -0.320568
## 3717  -0.2088439  0.2687299  0.2607292  0.143341
## 3818  -0.0779040  0.1276223  0.0765117  0.176885
## 3917   0.0903666  0.5352295  0.3719271 -0.196684
## 4018  -0.0936503  0.1228139  0.0819103  0.195914
## 4118  -0.4341499  0.1706520  0.0438300 -0.264771
## 4218  -0.1726104  0.1583731  0.1002162  0.084947
## 4318  -0.5228181  0.0932824  0.0464986 -0.075649
## 4418   0.3010049  0.6500339  0.3497498 -0.475355
## 4518   0.1806748 -0.2172782 -0.0964470 -0.043137
## 4617  -0.3938225 -0.0213444 -0.0868686  0.008451
## 4717  -0.0019412 -0.0251009 -0.1239138  0.169150
## 4817   0.0587268 -0.0408445 -0.1786840  0.112212
## 4917   0.1930141 -0.9117697  1.1430500 -0.358914
## 5017   0.0699635 -0.3926150  0.2745752  0.003129
## 5117   0.4738140 -0.7545096  0.2514974 -0.448515
## 5217  -0.0032321  0.4366666  0.3346488 -0.050134
## 5317  -0.0991255  0.0001188 -0.0361773  0.260361
## 5417  -0.1191643 -0.4154788  0.6535888 -0.042435
## 5517   0.3256873 -0.6037640  0.2360414 -0.277772
## 5617  -0.2908716 -0.1928482  0.0125187 -0.129068
## 5717   0.0059284  0.4186147  0.3108412 -0.051241
## 5817  -0.0966848 -0.3081321  0.6458608  0.080843
## 5917  -0.1585305 -0.1671604  0.4327133  0.207945
## 6017   0.2383897  0.4326889  0.1747268 -0.304965
## 6116  -0.0934366 -0.0861574  0.2104800  0.185460
## 6216   0.3256873 -0.6037640  0.2360414 -0.277772
## 6316  -0.0692823 -0.1524133  0.1292106  0.191456
## 6416  -0.1777277 -0.0471407 -0.1840244 -0.030958
## 6515   0.0556963 -0.1848458  0.0163818  0.074160
## 6615  -0.0467195  0.2358676  0.1636791  0.092025
## 6715   0.2387274 -0.5139925  0.2252751 -0.177175
## 6815   0.0556963 -0.1848458  0.0163818  0.074160
## 6915   0.0575974  0.0307091  0.7021803 -0.186017
```

```
## 7014  -0.3201705  0.0175531  0.0342496  0.252362
## 7114  -0.0557331 -0.2599952  0.6671404  0.014328
## 7214   0.0998066 -0.5451471  0.4399631 -0.065775
## 7314   0.0556963 -0.1848458  0.0163818  0.074160
## 7414  -0.0579612  0.1968459  0.1322558  0.122616
## 7514  -0.0551884 -0.1086440  0.4240054  0.070178
## 7614  -0.0939340  0.1682374  0.1271198  0.174509
## 7714  -0.0972975 -0.3015336  0.4728355  0.137327
## 7814   0.0210710 -0.0960784  0.6000812 -0.086621
## 7914  -0.0985045 -0.4727225  0.3801699 -0.110207
## 8014   0.0392641  0.4219575  0.2926349 -0.088259
## 8114  -0.3017078 -0.3997275  0.5274390 -0.076538
## 8213   0.1508317 -0.0647461 -0.2618349  0.025768
## 8314   0.2769308 -0.3545631 -0.0341628 -0.165198
## 8414   0.0989609 -0.0512854 -0.2150067  0.074451
## 8513  -0.3538940  0.0841423  0.0321039  0.020863
## 8614   0.1268751  0.3183460  0.1333722 -0.131838
## 8713  -0.0662518 -0.0084121 -0.0658552  0.229508
## 8814   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8914   0.0642599  0.1010010 -0.0416509  0.038551
## 9014   0.0313283  0.0903814 -0.0309185  0.078617
## 9114  -0.1743157  0.0658671 -0.0384080  0.005176
## 9213  -0.0315595  0.4689384  0.3849252 -0.035456
## 9313  -0.0435291  0.1931007  0.1192267  0.109071
## 9412  -0.0571861  0.0871668  0.0230355  0.174203
## 9512  -0.7261742  0.0018979 -0.3119413 -0.861248
## 9612  -0.1509963  0.0135795  0.0106509  0.309043
## 9713   0.0606740  0.1922441  0.0511092 -0.001239
## 9813   0.1268751  0.3183460  0.1333722 -0.131838
## 9913   0.0642599  0.1010010 -0.0416509  0.038551
## 10013  0.2518537  0.2859136  0.0205434 -0.249134
## 10113  0.1254435  0.5861147  0.3997234 -0.258270
## 10213  0.1507491 -0.6706730  0.5431557 -0.145308
## 10313  0.1268751  0.3183460  0.1333722 -0.131838
## 10413  0.1064464  0.5910446  0.4168737 -0.240441
## 10513 -0.1055707  0.1712572  0.1376252  0.185431
## 10613  0.0606740  0.1922441  0.0511092 -0.001239
## 10713 -0.1374123  0.2436483  0.2299386  0.184671
## 10813 -0.3689434  0.0514064  0.0681558  0.206460
## 10913 -0.0774465  0.0753691  0.0244201  0.201368
## 11013  0.1268751  0.3183460  0.1333722 -0.131838
## 11113 -0.1038339  0.2928818  0.2570650  0.125467
## 11213  0.0989609 -0.0512854 -0.2150067  0.074451
## 11312 -0.0467195  0.2358676  0.1636791  0.092025
## 11413 -0.0779040  0.1276223  0.0765117  0.176885
## 11513 -0.1338265  0.1524051  0.1371786  0.224462
## 11613  0.0258531 -0.0323136 -0.1490061  0.143065
## 11713 -0.0991255  0.0001188 -0.0361773  0.260361
## 11813 -0.0467195  0.2358676  0.1636791  0.092025
## 11913 -0.1540717 -0.2684000  0.4918380  0.049578
## 12013 -0.0274492  0.2489158  0.1641733  0.065315
## 12113  0.1339955 -0.0356989  0.1136782 -0.080306
```

```
## 12213  0.0203513 -0.5094085  0.6641863 -0.043499
## 12313  0.0510501 -0.2959462  0.1697589  0.046799
## 12412 -0.1089360 -0.2544291  0.3141920  0.196951
## 12513  0.2225079  0.1840509 -0.0614843 -0.169278
## 12613  0.3102600 -1.1312621  0.9559930 -0.413419
## 12713  0.4628843 -0.6986463  0.1909259 -0.423279
## 12813  0.1868566 -0.5005318  0.2721033 -0.128492
## 12911 -0.1733854 -0.0200604  0.3276099  0.238825
## 1307  -0.1412031 -0.5416633  0.1599226 -0.501943
## 13110 -0.1135577  0.0038640 -0.0231481  0.273906
## 1324   0.1868566 -0.5005318  0.2721033 -0.128492
## 1334   0.2227364 -0.4322602  0.1366541 -0.140253
## 1344   0.2387274 -0.5139925  0.2252751 -0.177175
## 1354   0.2387274 -0.5139925  0.2252751 -0.177175
## 1364  -0.2290989 -0.0924169 -0.3271874 -0.299000
## 1374  -0.0008835  0.2184892  0.1168633  0.051627
## 1384   0.1117181 -0.3116897  0.1149888 -0.010140
## 1394   0.1361646 -0.2665131  0.3568382 -0.127469
## 1404  -0.0233511  0.2046124  0.1176118  0.082130
## 14110  0.1425591  0.2501478  0.0556456 -0.115914
## 1424  -0.3027063 -0.0147083 -0.0711956  0.086338
## 1434  -0.2028803 -0.0462097  0.3207297  0.282659
## 1444  -0.1773619  0.1049787  0.1182711  0.293383
## 1454  -0.1860903  0.2254381  0.1870463  0.097734
## 1464   0.0989609 -0.0512854 -0.2150067  0.074451
## 1474   0.1466225 -0.4900909  0.3084260 -0.090731
## 1484   0.0258531 -0.0323136 -0.1490061  0.143065
## 1494   0.1425591  0.2501478  0.0556456 -0.115914
## 1504  -0.6792307  0.1276646  0.0464946 -0.279606
## 15110 -0.0208262  0.1492657  0.0611191  0.105895
## 1524   0.2383897  0.4326889  0.1747268 -0.304965
## 1534  -0.1871357  0.2401002  0.2585205  0.239200
## 1544  -0.0258978  0.3579912  0.2712933  0.011544
## 1554   0.0989609 -0.0512854 -0.2150067  0.074451
## 1564   0.1425591  0.2501478  0.0556456 -0.115914
## 1574   0.0244216  0.2354551  0.1173451  0.016632
## 1584   0.1999829  0.2993742  0.0673716 -0.200452
## 1593  -0.1191106  0.1650379  0.1402010  0.202789
## 1604   0.0989609 -0.0512854 -0.2150067  0.074451
## 16110 -0.0999555  0.4049574  0.3656568  0.067791
## 1624   0.3235299  0.5347106  0.2208940 -0.444181
## 1633  -0.3627077  0.0846799  0.0802213  0.139695
## 1644  -0.0180685  0.2229488  0.1323777  0.067756
## 1654   0.0989609 -0.0512854 -0.2150067  0.074451
## 1664   0.0587268 -0.0408445 -0.1786840  0.112212
## 1674   0.1041524  0.1168332 -0.0517097 -0.011401
## 1684  -0.1038339  0.2928818  0.2570650  0.125467
## 1694  -0.1269198  0.0073315 -0.0110850  0.286447
## 1704  -0.0190075  0.3320592  0.2411400  0.016615
## 17110  0.1999829  0.2993742  0.0673716 -0.200452
## 1724   0.2424530 -0.3075499  0.4275073 -0.279782
## 1733   0.1545573  0.1416965 -0.0596028 -0.076839
```

```
## 1744   0.3249615  0.2669418 -0.0454573 -0.317748
## 1754   0.0606740  0.1922441  0.0511092 -0.001239
## 1764   0.3010049  0.6500339  0.3497498 -0.475355
## 1774   0.0989609 -0.0512854 -0.2150067  0.074451
## 1784   0.2225079  0.1840509 -0.0614843 -0.169278
## 1794   0.0533253  0.2565564  0.1196030 -0.024162
## 1803  -0.3521011  0.0319886  0.0829636  0.315513
## 18110 -0.1102846  0.3206150  0.2099276 -0.087292
## 1824  -0.1055707  0.1712572  0.1376252  0.185431
## 1834   0.3966377  0.5157388  0.1548933 -0.512795
## 1844  -0.0019412 -0.0251009 -0.1239138  0.169150
## 1854  -0.0208262  0.1492657  0.0611191  0.105895
## 1864  -0.0260177 -0.0188530 -0.1021779  0.191747
## 1874   0.0587268 -0.0408445 -0.1786840  0.112212
## 1883  -0.0617578  0.0712978  0.0102566  0.186644
## 1893  -0.5237959 -0.1138800 -0.3778787 -0.550910
## 1903  -0.2069343  0.1713769  0.2031792  0.293076
## 19110 -0.0274492  0.2489158  0.1641733  0.065315
## 1923  -0.1692021  0.0659805  0.0743465  0.303348
## 1933  -0.2115218  0.1036849  0.1390406  0.330297
## 1943   0.0989609 -0.0512854 -0.2150067  0.074451
## 1953   0.0587268 -0.0408445 -0.1786840  0.112212
## 1963   0.0977578 -0.3998277  0.2494830 -0.022956
## 1973  -0.0740779 -0.2573043  0.5016887  0.091520
## 1983  -0.0662518 -0.0084121 -0.0658552  0.229508
## 1993  -0.5759319 -0.0541076 -0.1812579 -0.252443
## 2003   0.0989609 -0.0512854 -0.2150067  0.074451
## 20110  0.1545573  0.1416965 -0.0596028 -0.076839
## 2023  -0.1868515  0.1089406  0.0604094  0.123700
## 2033  -0.1794231  0.1868932  0.0490574 -0.140990
## 2043  -0.1200881 -0.0611810  0.5129493  0.116457
## 2053   0.2038230 -0.3355913  0.0318378 -0.096584
## 2063   0.0587268 -0.0408445 -0.1786840  0.112212
## 2073   0.0587268 -0.0408445 -0.1786840  0.112212
## 2083  -0.0719360  0.1483379  0.0931934  0.160645
## 2093  -0.0779040  0.1276223  0.0765117  0.176885
## 2109  -0.1470363 -0.2445420  0.3485883  0.232709
## 21110 -0.1005570  0.2678875  0.2301739  0.133929
## 2123  -0.1575737  0.0319328  0.3126757  0.049817
## 2133   0.0510501 -0.2959462  0.1697589  0.046799
## 2143   0.0989609 -0.0512854 -0.2150067  0.074451
## 2153  -0.3705375  0.1240817  0.1210464  0.120578
## 2163   0.2781043  0.3770328  0.0939196 -0.320568
## 2173  -0.0233511  0.2046124  0.1176118  0.082130
## 2183  -0.0991255  0.0001188 -0.0361773  0.260361
## 2193  -0.1237766  0.2236582  0.2013208  0.179735
## 2203  -0.1216505  0.1154421  0.0926786  0.229187
## 22110  0.0642599  0.1010010 -0.0416509  0.038551
## 2223   0.2262335  0.3904935  0.1407478 -0.271886
## 2233  -0.2106899  0.1065725  0.1413659  0.328033
## 2243   0.1545573  0.1416965 -0.0596028 -0.076839
## 2253  -0.0791828  0.0693424  0.0195669  0.206093
```

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## 2263  -0.1005570  0.2678875  0.2301739  0.133929
## 2273  -0.1957362 -0.0727486 -0.2656980 -0.177459
## 2283   0.0989609 -0.0512854 -0.2150067  0.074451
## 2293  -0.0991255  0.0001188 -0.0361773  0.260361
## 2303   0.1508317 -0.0647461 -0.2618349  0.025768
## 23110  0.2239395 -0.0837178 -0.3278356 -0.042846
## 2323  -0.1509963  0.0135795  0.0106509  0.309043
## 2333   0.0989609 -0.0512854 -0.2150067  0.074451
## 2343  -0.0019412 -0.0251009 -0.1239138  0.169150
## 2353   0.3488354 -0.7220771  0.3643262 -0.331219
## 2363   0.1254435  0.5861147  0.3997234 -0.258270
## 2373  -0.1269198  0.0073315 -0.0110850  0.286447
## 2383   0.0989609 -0.0512854 -0.2150067  0.074451
## 2393   0.0536552  0.1678810  0.0314901  0.017861
## 2403   0.2239395 -0.0837178 -0.3278356 -0.042846
## 24110  0.0975293  0.2164833  0.0513445 -0.051982
## 2423   0.0313283  0.0903814 -0.0309185  0.078617
## 2433   0.3489181 -0.1161503 -0.4406644 -0.160142
## 2443   0.1508317 -0.0647461 -0.2618349  0.025768
## 2453   0.1508317 -0.0647461 -0.2618349  0.025768
## 2463   0.1758286  0.3656302  0.1486409 -0.206448
## 2473   0.0258531 -0.0323136 -0.1490061  0.143065
## 2483   0.3489181 -0.1161503 -0.4406644 -0.160142
## 2493   0.1519522 -0.3221306  0.0786660 -0.047901
## 2503   0.0989609 -0.0512854 -0.2150067  0.074451
## 25110 -0.2283217 -0.0819730  0.4390016 -0.081292
## 2523   0.2038230 -0.3355913  0.0318378 -0.096584
## 2532   0.0989609 -0.0512854 -0.2150067  0.074451
## 2542   0.1508317 -0.0647461 -0.2618349  0.025768
## 2552  -0.1317776  0.0070858  0.3276588  0.181643
## 2562  -0.3891477  0.0432933  0.0027206  0.047331
## 2572   0.1508317 -0.0647461 -0.2618349  0.025768
## 2582  -0.0949725 -0.2934636  0.4793342  0.131000
## 2592   0.2337440 -0.7401792  0.5319487 -0.236751
## 2602  -0.1135577  0.0038640 -0.0231481  0.273906
## 2619   0.3489181 -0.1161503 -0.4406644 -0.160142
## 2622  -0.2364560  0.0257948  0.2978363 -0.019732
## 2632  -1.1310829 -0.3786173 -0.0225048 -0.945217
## 2642  -0.5991382 -0.2132909 -0.0340103 -0.381737
## 2652  -0.0472547 -0.0133419 -0.0830055  0.211679
## 2662  -0.0991255  0.0001188 -0.0361773  0.260361
## 2672   0.0989609 -0.0512854 -0.2150067  0.074451
## 2682  -1.1463343  0.0487949 -0.2774078 -1.178903
## 2692   0.3966377  0.5157388  0.1548933 -0.512795
## 2702   0.5216163  0.4833064  0.0420645 -0.630091
## 2719  -0.1135577  0.0038640 -0.0231481  0.273906
## 2722   0.3489181 -0.1161503 -0.4406644 -0.160142
## 2732  -0.2078129 -0.0135082 -0.0733432  0.136635
## 2742  -0.5364752 -0.0126515 -0.0496926 -0.010517
## 2752  -0.1221700  0.0702270  0.0481942  0.251345
## 2762  -0.3936401 -0.0086690 -0.0458872  0.076934
## 2772  -0.0260177 -0.0188530 -0.1021779  0.191747
```

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## 2782  -0.3540775 -0.0599845 -0.2143586 -0.181703
## 2792   0.1508317 -0.0647461 -0.2618349  0.025768
## 2802  -0.0575038  0.1445927  0.0801643  0.147100
## 2819  -0.2048398  0.0707919  0.1021217  0.338915
## 2822   0.0989609 -0.0512854 -0.2150067  0.074451
## 2832  -0.1135577  0.0038640 -0.0231481  0.273906
## 2841  -0.4163902 -0.0154880 -0.0664949  0.029632
## 2852  -0.3088187  0.0057178 -0.0047478  0.193738
## 2862  -0.0954934 -0.5654547  0.8064158  0.066055
## 2872   0.0989609 -0.0512854 -0.2150067  0.074451
## 2882   0.0989609 -0.0512854 -0.2150067  0.074451
## 2892  -0.0936149  0.0730876  0.0325960  0.219638
## 2902  -0.0834368 -0.0039525 -0.0503408  0.245637
## 2919   0.2225079  0.1840509 -0.0614843 -0.169278
## 2922  -0.1629898  0.1861577  0.1894623  0.239320
## 2932  -0.0118098 -0.5161822  0.5407288  0.038980
## 2942  -0.7741719  0.2296936  0.0762927 -0.574840
## 2952  -0.0019412 -0.0251009 -0.1239138  0.169150
## 2962  -0.6401020 -0.1051123 -0.3421341 -0.557307
## 2972   0.2239395 -0.0837178 -0.3278356 -0.042846
## 2982  -0.0774465  0.0753691  0.0244201  0.201368
## 2992   0.0313283  0.0903814 -0.0309185  0.078617
## 3001   0.2225079  0.1840509 -0.0614843 -0.169278
## 3019  -0.0190075  0.3320592  0.2411400  0.016615
## 3022  -0.2308580  0.0582502  0.0532631  0.233161
## 3032  -0.1864002 -0.0234760 -0.1069401  0.092736
## 3042  -0.0939334  0.0711261  0.3667087  0.110830
## 3052  -0.6938303 -0.0077209 -0.1906130 -0.493598
## 3062   0.0258531 -0.0323136 -0.1490061  0.143065
## 3072   0.1508317 -0.0647461 -0.2618349  0.025768
## 3081  -0.0472547 -0.0133419 -0.0830055  0.211679
## 3092  -0.0779040  0.1276223  0.0765117  0.176885
## 3108  -0.1799039  0.1573474  0.1718229  0.271059
## 3119   0.0989609 -0.0512854 -0.2150067  0.074451
## 3122  -0.0123446  0.3013459  0.2063941  0.024211
## 3132  -0.5694267 -0.0307088 -0.1059977 -0.123174
## 3142   0.0027426  0.1602048  0.0567477  0.075625
## 3152  -0.0514639 -0.4386867  0.4872555  0.095179
## 3162  -0.5988604 -0.0685753 -0.2265909 -0.341101
## 3172  -0.0617578  0.0712978  0.0102566  0.186644
## 3182   0.1545573  0.1416965 -0.0596028 -0.076839
## 3192  -0.1416590  0.2901002  0.2787258  0.166987
## 3202  -0.2585201  0.0189696  0.0349140  0.288475
## 3219  -0.2084154  0.0284799  0.0624880  0.362933
## 3222   0.0989609 -0.0512854 -0.2150067  0.074451
## 3232  -0.0739285 -0.2635137  0.2825877  0.164095
## 3242  -0.1096645 -0.3976961  0.2695545 -0.107241
## 3252  -0.1089360 -0.2544291  0.3141920  0.196951
## 3262   0.0989609 -0.0512854 -0.2150067  0.074451
## 3272  -0.1819819  0.0216203  0.0386243  0.338124
## 3282   0.2239395 -0.0837178 -0.3278356 -0.042846
## 3292   0.4628843 -0.6986463  0.1909259 -0.423279
```

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## 3302  -0.0662518 -0.0084121 -0.0658552  0.229508
## 3319  -0.8164518 -0.1179560 -0.3724683 -0.708052
## 3322  -0.3221463  0.2274526  0.1134820 -0.186595
## 3332   0.0628283  0.3687697  0.2247003 -0.087881
## 3342   0.0628283  0.3687697  0.2247003 -0.087881
## 3351   0.3787612 -0.2686824 -0.2752765 -0.229047
## 3362   0.3010049  0.6500339  0.3497498 -0.475355
## 3372   0.0587268 -0.0408445 -0.1786840  0.112212
## 3382  -0.3115426 -0.1227176 -0.4199447 -0.500581
## 3392  -0.0508337  0.2714357  0.2015921  0.079400
## 3402   0.1120250 -0.6075970  0.5076764 -0.093987
## 3419  -0.0785456  0.1752441  0.1241312  0.154810
## 3422   0.1545573  0.1416965 -0.0596028 -0.076839
## 3432   0.2647979 -0.6472421  0.3697553 -0.237369
## 3442   0.0313283  0.0903814 -0.0309185  0.078617
## 3452   0.3040555 -0.6796078  0.9840327 -0.483782
## 3462  -0.0269668 -0.5268762  0.9453539 -0.272831
## 3472  -0.1319846  0.1951670  0.1783775  0.202071
## 3482  -0.4416174 -0.0372675 -0.1353288 -0.099544
## 3492   0.5010308 -0.8936179  0.4023302 -0.511356
## 3502   0.2239395 -0.0837178 -0.3278356 -0.042846
## 3519  -0.0008835  0.2184892  0.1168633  0.051627
## 3522  -0.0596902  0.0784749  0.0160361  0.181017
## 3532   0.3489181 -0.1161503 -0.4406644 -0.160142
## 3542   0.1508317 -0.0647461 -0.2618349  0.025768
## 3552  -0.8522676 -0.0624187 -0.1905812 -0.424902
## 3562  -0.1777277 -0.0471407 -0.1840244 -0.030958
## 3572   0.0989609 -0.0512854 -0.2150067  0.074451
## 3582  -0.0953999  0.2065614  0.1660549  0.157754
## 3592   0.2239395 -0.0837178 -0.3278356 -0.042846
## 3602  -0.0019412 -0.0251009 -0.1239138  0.169150
## 3618   0.0587268 -0.0408445 -0.1786840  0.112212
## 3622  -0.1819819  0.0216203  0.0386243  0.338124
## 3632  -0.0400011  0.0827072  0.0075211  0.158074
## 3642  -0.1863707  0.0565109 -0.0027495  0.119755
## 3652   0.1508317 -0.0647461 -0.2618349  0.025768
## 3662   0.0587268 -0.0408445 -0.1786840  0.112212
## 3672  -0.0662518 -0.0084121 -0.0658552  0.229508
## 3682  -0.1468226  0.0688463  0.0627401  0.278199
## 3692  -0.1211531 -0.1389527  0.1760388  0.240139
## 3702  -0.0662518 -0.0084121 -0.0658552  0.229508
## 3718   0.3489181 -0.1161503 -0.4406644 -0.160142
## 3722  -0.9508601  0.0828603 -0.2383834 -1.058619
## 3732   0.0153674  0.3975376  0.2838551 -0.051199
## 3742   0.3489181 -0.1161503 -0.4406644 -0.160142
## 3752   0.0989609 -0.0512854 -0.2150067  0.074451
## 3762   0.0989609 -0.0512854 -0.2150067  0.074451
## 3772  -1.7624373 -0.2283881 -0.6695154 -1.740818
## 3782  -0.0162545  0.1651346  0.0738980  0.093455
## 3792  -0.0019412 -0.0251009 -0.1239138  0.169150
## 3802   0.0587268 -0.0408445 -0.1786840  0.112212
## 3819   0.0258531 -0.0323136 -0.1490061  0.143065
```

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## 3822  -0.0707139  0.1153554  0.3955618  0.065024
## 3832  -0.1269198  0.0073315 -0.0110850  0.286447
## 3842  -0.3223232 -0.3253186  0.0984866 -0.284124
## 3852   0.0989609 -0.0512854 -0.2150067  0.074451
## 3862   0.1806748 -0.2172782 -0.0964470 -0.043137
## 3872   0.0556963 -0.1848458  0.0163818  0.074160
## 3882   0.1041524  0.1168332 -0.0517097 -0.011401
## 3892  -0.4687739 -0.5545956  0.1389092 -0.722999
## 3902  -0.1269198  0.0073315 -0.0110850  0.286447
## 3918  -0.1097301  0.0669988  0.0369637  0.239670
## 3922  -0.1135577  0.0038640 -0.0231481  0.273906
## 3932   0.1508317 -0.0647461 -0.2618349  0.025768
## 3942   0.0244216  0.2354551  0.1173451  0.016632
## 3952   0.1087654 -0.7077468  0.6447775 -0.119454
## 3962  -0.4097156 -0.0669603 -0.2333841 -0.245040
## 3972   0.5216163  0.4833064  0.0420645 -0.630091
## 3982   0.6226383  0.8339660  0.3244428 -0.904994
## 3992   0.0556963 -0.1848458  0.0163818  0.074160
## 4002   0.2225079  0.1840509 -0.0614843 -0.169278
## 4019   0.0279020 -0.1776330  0.0414741  0.100245
## 4022   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4032  -0.0472547 -0.0133419 -0.0830055  0.211679
## 4042   0.3249615  0.2669418 -0.0454573 -0.317748
## 4052  -0.0472547 -0.0133419 -0.0830055  0.211679
## 4062  -0.0662518 -0.0084121 -0.0658552  0.229508
## 4072   0.2239395 -0.0837178 -0.3278356 -0.042846
## 4082  -0.3540775 -0.0599845 -0.2143586 -0.181703
## 4092   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4109  -0.0461342 -0.2707265  0.2574954  0.138009
## 4119  -0.0036366  0.2089330  0.1091679  0.059119
## 4122  -0.3122727 -0.0326435 -0.1285917 -0.014861
## 4132  -0.0991255  0.0001188 -0.0361773  0.260361
## 4141   0.2239395 -0.0837178 -0.3278356 -0.042846
## 4152  -0.1619273  0.0164161  0.0205192  0.319303
## 4161  -0.0019412 -0.0251009 -0.1239138  0.169150
## 4172   0.1288040 -0.2038175 -0.0496188  0.005546
## 4182   0.1508317 -0.0647461 -0.2618349  0.025768
## 4192  -0.2983132  0.1205502  0.1297076  0.199489
## 4202  -0.1509963  0.0135795  0.0106509  0.309043
## 4219  -0.1135577  0.0038640 -0.0231481  0.273906
## 4222  -0.0472547 -0.0133419 -0.0830055  0.211679
## 4232   0.2537826 -0.2362500 -0.1624476 -0.111751
## 4242  -0.1298996 -0.4084068  0.2362006 -0.174383
## 4252   0.2537826 -0.2362500 -0.1624476 -0.111751
## 4262  -0.0418151  0.1405214  0.0660008  0.132375
## 4272   0.3787612 -0.2686824 -0.2752765 -0.229047
## 4282   0.1806748 -0.2172782 -0.0964470 -0.043137
## 4292  -0.2362800  0.0695142  0.1211515  0.372932
## 4302  -0.8566859 -0.1075151 -0.3361455 -0.670291
## 4319  -0.1658930 -0.2252807 -0.1003101 -0.246364
## 4322  -0.0991255  0.0001188 -0.0361773  0.260361
## 4332   0.2227364 -0.4322602  0.1366541 -0.140253
```

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## 4342   0.0989609 -0.0512854 -0.2150067  0.074451
## 4352   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4362  -0.3115426 -0.1227176 -0.4199447 -0.500581
## 4372  -0.0791828  0.0693424  0.0195669  0.206093
## 4382   0.2225079  0.1840509 -0.0614843 -0.169278
## 4392   0.1508317 -0.0647461 -0.2618349  0.025768
## 4402   0.2781043  0.3770328  0.0939196 -0.320568
## 4419  -0.0837145 -0.1486681  0.1422398  0.205001
## 4422   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4432   0.2225079  0.1840509 -0.0614843 -0.169278
## 4442   0.0295787  0.1741290  0.0532261  0.040457
## 4452   0.1806748 -0.2172782 -0.0964470 -0.043137
## 4462  -0.1135577  0.0038640 -0.0231481  0.273906
## 4472  -0.0991255  0.0001188 -0.0361773  0.260361
## 4482  -0.0260177 -0.0188530 -0.1021779  0.191747
## 4492   0.1508317 -0.0647461 -0.2618349  0.025768
## 4502  -0.0472547 -0.0133419 -0.0830055  0.211679
## 4519   0.1508317 -0.0647461 -0.2618349  0.025768
## 4522   0.2239395 -0.0837178 -0.3278356 -0.042846
## 4532   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4542   0.2518537  0.2859136  0.0205434 -0.249134
## 4552   0.0258531 -0.0323136 -0.1490061  0.143065
## 4562   0.0587268 -0.0408445 -0.1786840  0.112212
## 4572   0.0033281  0.0830097 -0.0201502  0.111891
## 4582   0.0587268 -0.0408445 -0.1786840  0.112212
## 4592   0.2225079  0.1840509 -0.0614843 -0.169278
## 4602  -0.1921243 -0.0175795 -0.0875067  0.121911
## 4618   0.1508317 -0.0647461 -0.2618349  0.025768
## 4622   0.6943145  1.0827630  0.5247934 -1.100040
## 4632  -0.1135577  0.0038640 -0.0231481  0.273906
## 4642  -0.0472547 -0.0133419 -0.0830055  0.211679
## 4652   0.2225079  0.1840509 -0.0614843 -0.169278
## 4662  -0.0791828  0.0693424  0.0195669  0.206093
## 4672   0.2225079  0.1840509 -0.0614843 -0.169278
## 4682   0.1281990  0.0348466  0.8406663 -0.321997
## 4692  -0.0753789  0.0825462  0.0301996  0.195741
## 4702   0.2239395 -0.0837178 -0.3278356 -0.042846
## 4718   0.0989609 -0.0512854 -0.2150067  0.074451
## 4722  -0.0728748  0.0912380  0.0371990  0.188927
## 4732   0.0258531 -0.0323136 -0.1490061  0.143065
## 4742   0.1508317 -0.0647461 -0.2618349  0.025768
## 4751   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4762  -0.0991255  0.0001188 -0.0361773  0.260361
## 4772  -0.1119038  0.2182438 -0.0313685 -0.405585
## 4782  -0.6641785 -0.0988643 -0.3203982 -0.534710
## 4792   0.1174547  0.8555851  0.6719944 -0.378549
## 4802   0.3433354  0.7969682  0.4680727 -0.590545
## 4818  -0.1315719  0.1433647  0.0108186 -0.077273
## 4822   0.3952062  0.7835075  0.4212445 -0.639227
## 4832  -0.0106554  0.1845699  0.0895488  0.078218
## 4842  -0.1476862  0.0658486  0.0603261  0.280550
## 4852   0.0258531 -0.0323136 -0.1490061  0.143065
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## 4862  -0.0791828  0.0693424  0.0195669  0.206093
## 4872  -0.0991255  0.0001188 -0.0361773  0.260361
## 4882  -0.1904899  0.4483203  0.2196965 -0.504655
## 4892   0.3489181 -0.1161503 -0.4406644 -0.160142
## 4902  -0.0853698  0.3569728  0.3086760  0.075222
## 4918   0.0989609 -0.0512854 -0.2150067  0.074451
## 4922  -0.2252924  0.3204581  0.2642877 -0.016684
## 4932   0.3966377  0.5157388  0.1548933 -0.512795
## 4942  -0.0991255  0.0001188 -0.0361773  0.260361
## 4952  -0.0472547 -0.0133419 -0.0830055  0.211679
## 4962   0.1508317 -0.0647461 -0.2618349  0.025768
## 4972  -0.0991255  0.0001188 -0.0361773  0.260361
## 4982  -0.0991255  0.0001188 -0.0361773  0.260361
## 4992   0.1508317 -0.0647461 -0.2618349  0.025768
## 5002  -0.0834368 -0.0039525 -0.0503408  0.245637
## 5018  -0.0607187  0.1334334  0.0711779  0.155848
## 5022  -0.0873070  0.0949833  0.0502281  0.202472
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## 5042  -0.0991255  0.0001188 -0.0361773  0.260361
## 5052  -0.2000276  0.0263033  0.0549156  0.355061
## 5062  -0.4465872 -0.0494836 -0.1745207 -0.167760
## 5072   0.1508317 -0.0647461 -0.2618349  0.025768
## 5082  -0.1135577  0.0038640 -0.0231481  0.273906
## 5092   0.1508317 -0.0647461 -0.2618349  0.025768
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## 5118  -0.3070368 -0.0259487 -0.1072730  0.023683
## 5122  -0.0991255  0.0001188 -0.0361773  0.260361
## 5132  -0.0260177 -0.0188530 -0.1021779  0.191747
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## 5152   0.2781043  0.3770328  0.0939196 -0.320568
## 5162   0.2239395 -0.0837178 -0.3278356 -0.042846
## 5172  -0.0274492  0.2489158  0.1641733  0.065315
## 5182   0.1041524  0.1168332 -0.0517097 -0.011401
## 5192  -0.0300316  0.4334627  0.3487734 -0.020127
## 5202  -0.2536479  0.1235114  0.1858883  0.365583
## 5218  -0.0123446  0.3013459  0.2063941  0.024211
## 5222   0.0258531 -0.0323136 -0.1490061  0.143065
## 5232  -0.4036475 -0.0988161 -0.3367937 -0.414137
## 5242  -0.4365212 -0.0902852 -0.3071159 -0.383284
## 5252   0.0027426  0.1602048  0.0567477  0.075625
## 5262  -0.1382169  0.2078848  0.0912927 -0.069017
## 5272  -0.3022067 -0.0734451 -0.2611868 -0.230386
## 5282  -0.2035968 -0.1692534  0.0832815  0.038558
## 5292   0.0389223 -0.2604438  0.4256293 -0.027046
## 5302   0.3379057 -0.6662139  0.3037547 -0.305983
## 5318   0.1806748 -0.2172782 -0.0964470 -0.043137
## 5322  -0.1779698 -0.1660404  0.0920447  0.067731
## 5332  -0.3150293 -0.2988853  0.1835105 -0.138116
## 5342   0.4019094 -0.3869955 -0.1469916 -0.282494
## 5352  -0.1777277 -0.0471407 -0.1840244 -0.030958
## 5362   0.2007087 -0.5713316  0.3488702 -0.160475
## 5371   0.4019094 -0.3869955 -0.1469916 -0.282494
```

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## 5382  -0.1779698 -0.1660404  0.0920447  0.067731
## 5392   0.0885699 -0.1933766 -0.0132961  0.043307
## 5402  -0.1009528  0.1438743  0.1075007  0.193609
## 5418  -0.3634134 -0.1092570 -0.3731165 -0.451898
## 5422  -0.1402905 -0.5504980  0.4379113 -0.205526
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## 5442  -0.2849085 -0.3067018  0.1563179 -0.166386
## 5451   0.2129271 -0.6337814  0.4165835 -0.188686
## 5462   0.1120250 -0.6075970  0.5076764 -0.093987
## 5472  -0.1135577  0.0038640 -0.0231481  0.273906
## 5482   0.1508317 -0.0647461 -0.2618349  0.025768
## 5492   0.0989609 -0.0512854 -0.2150067  0.074451
## 5502   0.2239395 -0.0837178 -0.3278356 -0.042846
## 5518   0.1508317 -0.0647461 -0.2618349  0.025768
## 5522  -0.1135577  0.0038640 -0.0231481  0.273906
## 5532   0.2239395 -0.0837178 -0.3278356 -0.042846
## 5542  -0.1269198  0.0073315 -0.0110850  0.286447
## 5552   0.0989609 -0.0512854 -0.2150067  0.074451
## 5562  -0.4783704  0.0437977 -0.2509044 -0.674522
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## 5582   0.4506659 -0.6361965  0.1232126 -0.395068
## 5592   0.1306315 -0.4083586  0.2198051 -0.053809
## 5602   0.2958442 -0.4512319  0.0706535 -0.208867
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## 5622   0.2239395 -0.0837178 -0.3278356 -0.042846
## 5632   0.0975293  0.2164833  0.0513445 -0.051982
## 5642  -0.0335646  0.3313788  0.2498629  0.032407
## 5652   0.0989609 -0.0512854 -0.2150067  0.074451
## 5662  -0.2823078  0.1837379  0.0665536 -0.150098
## 5672   0.1143232  0.1521374 -0.0232800 -0.039078
## 5682  -0.0534719  0.2124289  0.1448045  0.110400
## 5692  -0.0596902  0.0784749  0.0160361  0.181017
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## 5752   0.0989609 -0.0512854 -0.2150067  0.074451
## 5762  -0.0918787  0.0791143  0.0374492  0.214913
## 5772   0.1868566 -0.5005318  0.2721033 -0.128492
## 5782  -0.0491282  0.1736654  0.1035759  0.124308
## 5792   0.3249615  0.2669418 -0.0454573 -0.317748
## 5802   0.0186488  0.4627689  0.3463976 -0.085856
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## 5832   0.0269736 -0.2896982  0.1914948  0.069395
## 5842   0.0269736 -0.2896982  0.1914948  0.069395
## 5852   0.2537826 -0.2362500 -0.1624476 -0.111751
## 5862   0.0964757 -0.1382684  0.2967332 -0.076814
## 5872   0.0723992 -0.1320205  0.3184691 -0.054217
## 5882  -0.1135577  0.0038640 -0.0231481  0.273906
## 5892  -1.1440225 -0.1308883 -0.3934818 -0.929109
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## 5902   0.0556963 -0.1848458  0.0163818  0.074160
## 5918   0.2781043  0.3770328  0.0939196 -0.320568
## 5922   0.0269736 -0.2896982  0.1914948  0.069395
## 5932   0.3489181 -0.1161503 -0.4406644 -0.160142
## 5942   0.3489181 -0.1161503 -0.4406644 -0.160142
## 5952  -0.0834368 -0.0039525 -0.0503408  0.245637
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## 5972  -0.0242479 -0.0546219  0.1970748  0.096876
## 5982   0.2239395 -0.0837178 -0.3278356 -0.042846
## 5992   0.4019094 -0.3869955 -0.1469916 -0.282494
## 6002   0.0885699 -0.1933766 -0.0132961  0.043307
## 6018  -0.1700499 -0.3062269  0.1505567 -0.110782
## 6022  -0.1886819 -0.1800359  0.0474626 -0.012739
## 6032   0.2769308 -0.3545631 -0.0341628 -0.165198
## 6042   0.0788444 -0.3031589  0.1446666  0.020713
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## 6062   0.2537826 -0.2362500 -0.1624476 -0.111751
## 6072  -0.0070629 -0.0590815  0.1815605  0.080747
## 6082   0.1288040 -0.2038175 -0.0496188  0.005546
## 6092   0.2605887 -1.0725870  0.9400163 -0.353868
## 6109  -0.0834368 -0.0039525 -0.0503408  0.245637
## 6117   0.1508317 -0.0647461 -0.2618349  0.025768
## 6122  -0.0260177 -0.0188530 -0.1021779  0.191747
## 6132   0.2239395 -0.0837178 -0.3278356 -0.042846
## 6142   0.3489181 -0.1161503 -0.4406644 -0.160142
## 6152  -0.0472547 -0.0133419 -0.0830055  0.211679
## 6162  -0.2744046  0.1267495 -0.0806905 -0.355590
## 6172  -0.0274492  0.2489158  0.1641733  0.065315
## 6182  -0.0019412 -0.0251009 -0.1239138  0.169150
## 6192  -0.0834368 -0.0039525 -0.0503408  0.245637
## 6202  -0.0179089  0.0885208 -0.0009778  0.131823
## 6217  -0.0179089  0.0885208 -0.0009778  0.131823
## 6222  -0.0834368 -0.0039525 -0.0503408  0.245637
## 6232  -0.0662518 -0.0084121 -0.0658552  0.229508
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## 6262  -0.0662518 -0.0084121 -0.0658552  0.229508
## 6272   0.0989609 -0.0512854 -0.2150067  0.074451
## 6282  -0.0019412 -0.0251009 -0.1239138  0.169150
## 6292   0.0258531 -0.0323136 -0.1490061  0.143065
## 6302  -0.0369061  0.0934506  0.0161725  0.149652
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## 6332   0.0587268 -0.0408445 -0.1786840  0.112212
## 6342  -0.3001578 -0.2187645 -0.0707066 -0.273205
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## 6362   0.0556963 -0.1848458  0.0163818  0.074160
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## 6392  -0.0662518 -0.0084121 -0.0658552  0.229508
## 6402  -0.0662518 -0.0084121 -0.0658552  0.229508
## 6417  -0.1890471 -0.3012971  0.1677070 -0.092952
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## 6422  -0.0662518 -0.0084121 -0.0658552  0.229508
## 6432  -0.0036366  0.2089330  0.1091679  0.059119
## 6442   0.0226141  0.3000522  0.1825442 -0.012315
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## 6462   0.0556963 -0.1848458  0.0163818  0.074160
## 6472   0.0910841  0.3876217  0.2251470 -0.126912
## 6482   0.2958442 -0.4512319  0.0706535 -0.208867
## 6492   0.1708656 -0.4187995  0.1834823 -0.091570
## 6502   0.1708656 -0.4187995  0.1834823 -0.091570
## 6516  -0.0472547 -0.0133419 -0.0830055  0.211679
## 6522   0.1706371  0.1975116 -0.0146562 -0.120596
## 6532   0.1254435  0.5861147  0.3997234 -0.258270
## 6541  -0.0088479  0.1199727  0.0243498  0.107166
## 6552   0.0123891  0.1144616  0.0051773  0.087234
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## 6602   0.3489181 -0.1161503 -0.4406644 -0.160142
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## 6652   0.2239395 -0.0837178 -0.3278356 -0.042846
## 6662   0.3489181 -0.1161503 -0.4406644 -0.160142
## 6672   0.1041524  0.1168332 -0.0517097 -0.011401
## 6682   0.0244216  0.2354551  0.1173451  0.016632
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## 6716  -0.0472547 -0.0133419 -0.0830055  0.211679
## 6722   0.1508317 -0.0647461 -0.2618349  0.025768
## 6732   0.2239395 -0.0837178 -0.3278356 -0.042846
## 6742   0.2239395 -0.0837178 -0.3278356 -0.042846
## 6752   0.2239395 -0.0837178 -0.3278356 -0.042846
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## 6782   0.3489181 -0.1161503 -0.4406644 -0.160142
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## 6822  -0.0260177 -0.0188530 -0.1021779  0.191747
## 6832   0.0587268 -0.0408445 -0.1786840  0.112212
## 6842   0.0885699 -0.1933766 -0.0132961  0.043307
## 6852   0.2038230 -0.3355913  0.0318378 -0.096584
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## 6931   0.0712787  0.1253641 -0.0220318  0.019452
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## 6981   0.3489181 -0.1161503 -0.4406644 -0.160142
## 6991   0.0258531 -0.0323136 -0.1490061  0.143065
## 7001   0.1545573  0.1416965 -0.0596028 -0.076839
## 7015  -0.0019412 -0.0251009 -0.1239138  0.169150
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## 7031   0.3489181 -0.1161503 -0.4406644 -0.160142
## 7041  -0.3300010 -0.0662324 -0.2360945 -0.204300
## 7051  -0.2693330 -0.0819760 -0.2908646 -0.261239
## 7061  -0.3022067 -0.0734451 -0.2611868 -0.230386
## 7071  -0.3300010 -0.0662324 -0.2360945 -0.204300
## 7081   0.1708656 -0.4187995  0.1834823 -0.091570
## 7091   0.0989609 -0.0512854 -0.2150067  0.074451
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## 7115   0.1268751  0.3183460  0.1333722 -0.131838
## 7121  -0.0019412 -0.0251009 -0.1239138  0.169150
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## 7141   0.1859994  0.4009344  0.1770706 -0.234125
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## 7171   0.0587268 -0.0408445 -0.1786840  0.112212
## 7181   0.0587268 -0.0408445 -0.1786840  0.112212
## 7191   0.0258531 -0.0323136 -0.1490061  0.143065
## 7201   0.0258531 -0.0323136 -0.1490061  0.143065
## 7215   0.0989609 -0.0512854 -0.2150067  0.074451
## 7221   0.1859994  0.4009344  0.1770706 -0.234125
## 7231   0.0258531 -0.0323136 -0.1490061  0.143065
## 7241   0.0975293  0.2164833  0.0513445 -0.051982
## 7251   0.0258531 -0.0323136 -0.1490061  0.143065
## 7261   0.0587268 -0.0408445 -0.1786840  0.112212
## 7271   0.0258531 -0.0323136 -0.1490061  0.143065
## 7281   0.0885699 -0.1933766 -0.0132961  0.043307
## 7291  -0.3092485  0.3514937  0.0486387 -0.729620
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## 7341   0.0258531 -0.0323136 -0.1490061  0.143065
## 7351   0.0587268 -0.0408445 -0.1786840  0.112212
## 7361   0.0975293  0.2164833  0.0513445 -0.051982
## 7371   0.0258531 -0.0323136 -0.1490061  0.143065
## 7381   0.2239395 -0.0837178 -0.3278356 -0.042846
## 7391   0.0258531 -0.0323136 -0.1490061  0.143065
## 7401   0.3489181 -0.1161503 -0.4406644 -0.160142
## 7415  -0.1683110  0.2686837 -0.0084863 -0.536141
## 7421   0.1304030  0.2079525  0.0216666 -0.082835
## 7431  -0.4036475 -0.0988161 -0.3367937 -0.414137
## 7441   0.0587268 -0.0408445 -0.1786840  0.112212
## 7451   0.4264808  0.3632067  0.3202812 -0.581700
```

```
## 7461   0.1288040 -0.2038175 -0.0496188  0.005546
## 7471   0.1806748 -0.2172782 -0.0964470 -0.043137
## 7481   0.1288040 -0.2038175 -0.0496188  0.005546
## 7491   0.3533731  0.3821784  0.3862819 -0.513086
## 7501   0.3015023  0.3956391  0.4331100 -0.464403
## 7515   0.1288040 -0.2038175 -0.0496188  0.005546
## 7521   0.1806748 -0.2172782 -0.0964470 -0.043137
## 7531   0.1288040 -0.2038175 -0.0496188  0.005546
## 7541   0.0989609 -0.0512854 -0.2150067  0.074451
## 7551   0.2716591  0.5481712  0.2677221 -0.395498
## 7561   0.0989609 -0.0512854 -0.2150067  0.074451
## 7571   0.1508317 -0.0647461 -0.2618349  0.025768
## 7581   0.1288040 -0.2038175 -0.0496188  0.005546
## 7591   0.1508317 -0.0647461 -0.2618349  0.025768
## 7601   0.2239395 -0.0837178 -0.3278356 -0.042846
## 7615   0.0989609 -0.0512854 -0.2150067  0.074451
## 7621   0.2239395 -0.0837178 -0.3278356 -0.042846
## 7631   0.0989609 -0.0512854 -0.2150067  0.074451
## 7641   0.0989609 -0.0512854 -0.2150067  0.074451
## 7651   0.2716591  0.5481712  0.2677221 -0.395498
## 7661   0.0989609 -0.0512854 -0.2150067  0.074451
## 7671   0.0989609 -0.0512854 -0.2150067  0.074451
## 7681   0.0989609 -0.0512854 -0.2150067  0.074451
## 7691   0.0989609 -0.0512854 -0.2150067  0.074451
## 7701   0.0989609 -0.0512854 -0.2150067  0.074451
## 7715   0.0989609 -0.0512854 -0.2150067  0.074451
## 7721   0.1966948 -0.1190159  0.7998215 -0.372350
## 7731  -0.4729880 -0.0594078 -0.2049393 -0.233505
## 7741   0.1508317 -0.0647461 -0.2618349  0.025768
## 7751   0.2239395 -0.0837178 -0.3278356 -0.042846
## 7761  -0.0260177 -0.0188530 -0.1021779  0.191747
## 7771   0.0989609 -0.0512854 -0.2150067  0.074451
## 7781   0.2239395 -0.0837178 -0.3278356 -0.042846
## 7791  -0.0834368 -0.0039525 -0.0503408  0.245637
## 7801  -0.0662518 -0.0084121 -0.0658552  0.229508
## 7815  -0.0662518 -0.0084121 -0.0658552  0.229508
## 7821  -0.0418151  0.1405214  0.0660008  0.132375
## 7831  -0.1704453  0.0576708 -0.0269093  0.062918
## 7841   0.2239395 -0.0837178 -0.3278356 -0.042846
## 7851   0.3249615  0.2669418 -0.0454573 -0.317748
## 7861   0.1134111  0.4651213  0.2875556 -0.187669
## 7871  -0.0607187  0.1334334  0.0711779  0.155848
## 7881   0.2314250  0.5586121  0.3040449 -0.357737
## 7891   0.1768724  0.4918927  0.2731254 -0.267891
## 7901  -0.0061614  0.2642798  0.1656606  0.035354
## 7915  -0.2385362  0.0362964  0.0896807  0.391203
## 7921  -0.0260177 -0.0188530 -0.1021779  0.191747
## 7931   0.3249615  0.2669418 -0.0454573 -0.317748
## 7941  -0.3779523 -0.0029500 -0.0283882  0.115039
## 7951   0.4976597  0.8663985  0.4372716 -0.787697
## 7961   0.0869247  0.2833634  0.1244855 -0.072673
## 7971  -0.0834368 -0.0039525 -0.0503408  0.245637
```

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## 7981  -0.1079949  0.2420697  0.2093834  0.154169
## 7991   0.0099184  0.3200948  0.2106072 -0.008403
## 8001   0.2225079  0.1840509 -0.0614843 -0.169278
## 8015  -0.0834368 -0.0039525 -0.0503408  0.245637
## 8021  -0.0019412 -0.0251009 -0.1239138  0.169150
## 8031   0.2225079  0.1840509 -0.0614843 -0.169278
## 8041   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8051   0.3966377  0.5157388  0.1548933 -0.512795
## 8061  -0.1343803  0.1868512  0.1716810  0.208590
## 8071   0.1758286  0.3656302  0.1486409 -0.206448
## 8081  -0.1445213  0.1152821  0.1072843  0.253565
## 8091   0.0033281  0.0830097 -0.0201502  0.111891
## 8108  -0.2032286  0.1324717  0.1622220  0.307729
## 8115   0.2225079  0.1840509 -0.0614843 -0.169278
## 8121   0.3249615  0.2669418 -0.0454573 -0.317748
## 8131  -0.0976889  0.2393952  0.2000793  0.144496
## 8141  -0.1391549  0.2987921  0.2857251  0.160173
## 8151  -0.0061614  0.2642798  0.1656606  0.035354
## 8161   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8171  -2.0171076 -0.0771363 -0.5224288 -1.980519
## 8181  -0.0662518 -0.0084121 -0.0658552  0.229508
## 8191   0.4976597  0.8663985  0.4372716 -0.787697
## 8201  -0.0233511  0.2046124  0.1176118  0.082130
## 8214  -0.0019412 -0.0251009 -0.1239138  0.169150
## 8221  -0.0260177 -0.0188530 -0.1021779  0.191747
## 8231   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8241  -0.0834368 -0.0039525 -0.0503408  0.245637
## 8251  -0.0834368 -0.0039525 -0.0503408  0.245637
## 8261   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8271  -0.1722333  0.0190905  0.0298233  0.328975
## 8281  -0.0019412 -0.0251009 -0.1239138  0.169150
## 8291  -0.7664704  0.0090828 -0.0993325 -0.351817
## 8301   0.3249615  0.2669418 -0.0454573 -0.317748
## 8315   0.0949470  0.4010303  0.2359446 -0.137424
## 8321  -0.3338424 -0.0492737 -0.1810047 -0.114562
## 8331  -0.1097301  0.0669988  0.0369637  0.239670
## 8341  -0.1790743  0.0662157  0.0809526  0.313725
## 8351   0.0279020 -0.1776330  0.0414741  0.100245
## 8361   0.4837012 -0.8050441  0.3062911 -0.471344
## 8371  -0.1160138 -0.4116386  0.7116271  0.099745
## 8381  -0.0260177 -0.0188530 -0.1021779  0.191747
## 8391  -0.2348715  0.2510474  0.1842448 -0.018970
## 8401  -0.0950936  0.0679550  0.0284629  0.223661
## 8415  -0.0514639 -0.4386867  0.4872555  0.095179
## 8421  -0.0767444  0.2279047  0.1751685  0.127733
## 8431   0.0033281  0.0830097 -0.0201502  0.111891
## 8441   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8451   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8461  -0.1522151 -0.2109133 -0.0547139 -0.162519
## 8471  -0.0662518 -0.0084121 -0.0658552  0.229508
## 8481  -0.1393596  0.0105597  0.0001455  0.298122
## 8491  -0.1393596  0.0105597  0.0001455  0.298122
```

```
## 8501  -0.2084154  0.0284799  0.0624880  0.362933
## 8514  -0.1619273  0.0164161  0.0205192  0.319303
## 8521   0.1508317 -0.0647461 -0.2618349  0.025768
## 8531   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8541   0.2239395 -0.0837178 -0.3278356 -0.042846
## 8551  -0.0834368 -0.0039525 -0.0503408  0.245637
## 8561   0.1041524  0.1168332 -0.0517097 -0.011401
## 8571   0.1041524  0.1168332 -0.0517097 -0.011401
## 8581   0.0258531 -0.0323136 -0.1490061  0.143065
## 8591  -0.0117606  0.2448445  0.1500098  0.050590
## 8601  -0.0019412 -0.0251009 -0.1239138  0.169150
## 8615   0.0175805  0.2825803  0.1684744  0.001382
## 8621  -0.1258621  0.2509217  0.2296921  0.168923
## 8631  -0.4274771  0.0201854  0.0495800  0.217012
## 8641   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8651   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8661   0.3249615  0.2669418 -0.0454573 -0.317748
## 8671   0.0438312  0.3736995  0.2418507 -0.070052
## 8681   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8691  -0.0472547 -0.0133419 -0.0830055  0.211679
## 8701   0.0018965  0.3507784  0.2462010 -0.014542
## 8714  -0.0208262  0.1492657  0.0611191  0.105895
## 8721   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8731   0.0244216  0.2354551  0.1173451  0.016632
## 8741   0.2383897  0.4326889  0.1747268 -0.304965
## 8751   0.1597488  0.3098152  0.1036943 -0.162691
## 8761   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8771   0.0175805  0.2825803  0.1684744  0.001382
## 8781   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8791  -0.0991255  0.0001188 -0.0361773  0.260361
## 8801  -0.0019412 -0.0251009 -0.1239138  0.169150
## 8815   0.0587268 -0.0408445 -0.1786840  0.112212
## 8821  -0.1393596  0.0105597  0.0001455  0.298122
## 8831   0.1531258  0.4094653  0.2067485 -0.203272
## 8841   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8851  -0.1483297  0.2370449  0.2304406  0.199427
## 8861   0.3249615  0.2669418 -0.0454573 -0.317748
## 8871  -0.0834368 -0.0039525 -0.0503408  0.245637
## 8881   0.0869247  0.2833634  0.1244855 -0.072673
## 8891   0.1041524  0.1168332 -0.0517097 -0.011401
## 8901   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8915   0.5216163  0.4833064  0.0420645 -0.630091
## 8921   0.0936666  0.5466844  0.3811515 -0.205664
## 8931  -0.0662518 -0.0084121 -0.0658552  0.229508
## 8941   0.1999829  0.2993742  0.0673716 -0.200452
## 8951  -0.0267767  0.3050912  0.2194233  0.037757
## 8961   0.2225079  0.1840509 -0.0614843 -0.169278
## 8971   0.3489181 -0.1161503 -0.4406644 -0.160142
## 8981   0.6226383  0.8339660  0.3244428 -0.904994
## 8991  -0.1025679  0.2675163  0.1273894 -0.135390
## 9001   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9015  -0.1157978  0.4078404  0.3190640 -0.073052
```

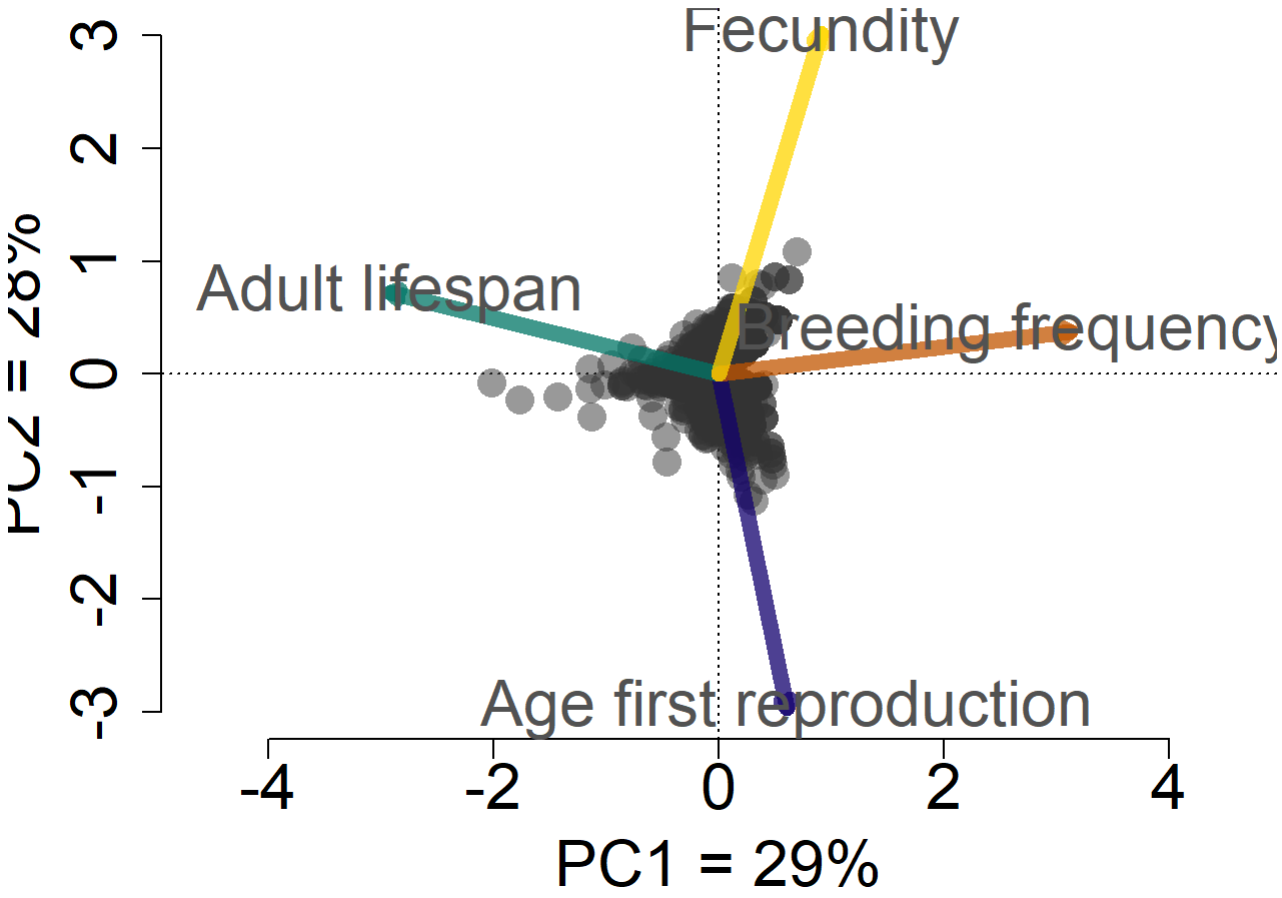
```
## 9021  -0.0662518 -0.0084121 -0.0658552  0.229508
## 9031  -0.2640535  0.0215041  0.0434625  0.299597
## 9041   0.1508317 -0.0647461 -0.2618349  0.025768
## 9051  -0.0019412 -0.0251009 -0.1239138  0.169150
## 9061  -0.0418151  0.1405214  0.0660008  0.132375
## 9071  -0.5782799 -0.0399925 -0.1354595 -0.177360
## 9081  -0.0662518 -0.0084121 -0.0658552  0.229508
## 9091  -0.0019412 -0.0251009 -0.1239138  0.169150
## 9107  -0.0260177 -0.0188530 -0.1021779  0.191747
## 9115   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9121   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9131  -0.3060277  0.0532963  0.0562797  0.209070
## 9141  -0.1712806  0.2951353  0.3028390  0.196055
## 9151   0.3249615  0.2669418 -0.0454573 -0.317748
## 9161  -0.1343803  0.1868512  0.1716810  0.208590
## 9171  -0.0834368 -0.0039525 -0.0503408  0.245637
## 9181  -0.0779040  0.1276223  0.0765117  0.176885
## 9191   0.5216163  0.4833064  0.0420645 -0.630091
## 9201   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9214  -0.0767444  0.2279047  0.1751685  0.127733
## 9221   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9231  -0.2401065  0.0606502  0.0616125  0.241841
## 9241  -0.1722333  0.0190905  0.0298233  0.328975
## 9251  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9261  -0.1476862  0.0658486  0.0603261  0.280550
## 9271   0.1508317 -0.0647461 -0.2618349  0.025768
## 9281   0.2239395 -0.0837178 -0.3278356 -0.042846
## 9291  -0.4729880 -0.0594078 -0.2049393 -0.233505
## 9301  -0.0418151  0.1405214  0.0660008  0.132375
## 9314  -0.0208262  0.1492657  0.0611191  0.105895
## 9321  -0.0019412 -0.0251009 -0.1239138  0.169150
## 9331   0.2239395 -0.0837178 -0.3278356 -0.042846
## 9341   0.0587268 -0.0408445 -0.1786840  0.112212
## 9351   0.0989609 -0.0512854 -0.2150067  0.074451
## 9361  -0.5979666 -0.0269754 -0.0921105 -0.116208
## 9371  -0.0260177 -0.0188530 -0.1021779  0.191747
## 9381   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9391  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9401  -0.0550151 -0.3601826  0.3874040  0.120426
## 9413   0.4738140 -0.7545096  0.2514974 -0.448515
## 9421   0.0258531 -0.0323136 -0.1490061  0.143065
## 9431   0.3139491 -0.2831218  0.6989618 -0.463589
## 9441  -0.0991255  0.0001188 -0.0361773  0.260361
## 9451   0.1545573  0.1416965 -0.0596028 -0.076839
## 9461   0.1806748 -0.2172782 -0.0964470 -0.043137
## 9471  -0.1619273  0.0164161  0.0205192  0.319303
## 9481  -0.0210040  0.0777774 -0.0096292  0.140245
## 9491  -0.0662518 -0.0084121 -0.0658552  0.229508
## 9501  -0.1619273  0.0164161  0.0205192  0.319303
## 9513  -0.0260177 -0.0188530 -0.1021779  0.191747
## 9521  -0.0260177 -0.0188530 -0.1021779  0.191747
## 9531   0.0258531 -0.0323136 -0.1490061  0.143065
```

```
## 9541  -0.1135577  0.0038640 -0.0231481  0.273906
## 9551   0.1508317 -0.0647461 -0.2618349  0.025768
## 9561   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9571  -0.0950936  0.0679550  0.0284629  0.223661
## 9581  -0.0617578  0.0712978  0.0102566  0.186644
## 9591  -0.0991255  0.0001188 -0.0361773  0.260361
## 9601  -0.1819819  0.0216203  0.0386243  0.338124
## 9613  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9621   0.0313283  0.0903814 -0.0309185  0.078617
## 9631   0.2239395 -0.0837178 -0.3278356 -0.042846
## 9641  -0.1667581  0.1417856  0.1479109  0.264528
## 9651  -0.0662518 -0.0084121 -0.0658552  0.229508
## 9661  -0.1820582 -0.0583812 -0.2201018 -0.093614
## 9671  -0.1135577  0.0038640 -0.0231481  0.273906
## 9681  -0.1358916  0.0660096  0.0528717  0.267940
## 9691  -0.2000276  0.0263033  0.0549156  0.355061
## 9701  -0.2164303  0.0305598  0.0697238  0.370455
## 9714  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9721   0.1508317 -0.0647461 -0.2618349  0.025768
## 9731  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9741   0.0989609 -0.0512854 -0.2150067  0.074451
## 9751  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9761  -0.2223962  0.1348098  0.1288854  0.201191
## 9771   0.3489181 -0.1161503 -0.4406644 -0.160142
## 9781  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9791  -0.0472547 -0.0133419 -0.0830055  0.211679
## 9801   0.0027426  0.1602048  0.0567477  0.075625
## 9814  -0.2650320  0.2254978  0.2005105  0.083224
## 9821   0.0587268 -0.0408445 -0.1786840  0.112212
## 9831   0.0443643  0.3046787  0.1730893 -0.037636
## 9841   0.0099184  0.3200948  0.2106072 -0.008403
## 9851  -0.2122896  0.1010197  0.1368944  0.332386
## 9861   0.0697351  0.2236961  0.0764367 -0.025896
## 9871  -0.0866137  0.2778386  0.2310369  0.114358
## 9881  -0.1269198  0.0073315 -0.0110850  0.286447
## 9891  -0.1194169  0.0797833  0.0558897  0.243854
## 9901  -0.8561968 -0.0793159 -0.2449783 -0.517897
## 9914  -0.1135577  0.0038640 -0.0231481  0.273906
## 9921  -0.0425052  0.0740153  0.0005218  0.164888
## 9931   0.0587268 -0.0408445 -0.1786840  0.112212
## 9941   0.0989609 -0.0512854 -0.2150067  0.074451
## 9951   0.1508317 -0.0647461 -0.2618349  0.025768
## 9961  -0.0260177 -0.0188530 -0.1021779  0.191747
## 9971   0.0258531 -0.0323136 -0.1490061  0.143065
## 9981  -0.0766268  0.3873210  0.3331147  0.051430
## 9991  -0.8566859 -0.1075151 -0.3361455 -0.670291
## 10001  0.0800180  0.4284370  0.2727491 -0.134658
## 10014  0.0508500  0.3980626  0.2614697 -0.089151
## 10021 -0.0662518 -0.0084121 -0.0658552  0.229508
## 10031  0.0989609 -0.0512854 -0.2150067  0.074451
## 10041 -0.2447904  0.1542571  0.2106471  0.341480
## 10051 -0.0112297 -0.4491276  0.4509327  0.057418
```

```
## 10061 -0.0950936  0.0679550  0.0284629  0.223661
## 10071 -0.5871107 -0.3759575 -0.0484614 -0.679659
## 10081  0.1856535 -0.8490742  0.7365930 -0.225899
## 10091  0.2525795 -0.5847923  0.3020420 -0.209158
## 10108  0.0038255 -0.1713851  0.0632100  0.122842
## 10114 -0.1865872 -0.1219723  0.2351117  0.301550
## 10121  0.0989609 -0.0512854 -0.2150067  0.074451
## 10131  0.0699635 -0.3926150  0.2745752  0.003129
## 10141  0.3968661 -0.1005723  0.3530318 -0.483769
## 10151 -0.0008835  0.2184892  0.1168633  0.051627
## 10161  0.3489181 -0.1161503 -0.4406644 -0.160142
## 10171 -0.0278450  0.1249025  0.0415001  0.124995
## 10181 -0.3758086  0.0105773  0.0152241  0.189025
## 10191 -0.3207147 -0.0403161 -0.1528692 -0.060163
## 10201 -0.0920998  0.2180163  0.1752793  0.148774
## 10214  0.0989609 -0.0512854 -0.2150067  0.074451
## 10221  0.0163313 -0.0227102  0.6758675 -0.116644
## 10231 -0.0472547 -0.0133419 -0.0830055  0.211679
## 10241  0.0258531 -0.0323136 -0.1490061  0.143065
## 10251 -0.0662518 -0.0084121 -0.0658552  0.229508
## 10261 -0.0674549 -0.3569544  0.3986345  0.132101
## 10271  0.0989609 -0.0512854 -0.2150067  0.074451
## 10281 -0.1973402  0.0669233  0.0934456  0.332795
## 10291 -0.0662518 -0.0084121 -0.0658552  0.229508
## 10301 -0.1912304  0.0240204  0.0469737  0.346804
## 10314  0.0533253  0.2565564  0.1196030 -0.024162
## 10321  0.2239395 -0.0837178 -0.3278356 -0.042846
## 10331 -0.1506671 -0.2023499  0.6056047  0.146639
## 10341 -0.0936503  0.1228139  0.0819103  0.195914
## 10351  0.2225079  0.1840509 -0.0614843 -0.169278
## 10361 -0.0774465  0.0753691  0.0244201  0.201368
## 10371  0.1508317 -0.0647461 -0.2618349  0.025768
## 10381  0.0989609 -0.0512854 -0.2150067  0.074451
## 10391 -0.1777277 -0.0471407 -0.1840244 -0.030958
## 10401  0.2239395 -0.0837178 -0.3278356 -0.042846
## 10414  0.0258531 -0.0323136 -0.1490061  0.143065
## 10421 -0.3917086  0.0222348  0.0539354  0.244589
## 10431  0.0611714 -0.0621507  0.1344694  0.009712
## 10441  0.0989609 -0.0512854 -0.2150067  0.074451
## 10451  0.0018965  0.3507784  0.2462010 -0.014542
## 10461 -0.0435291  0.1931007  0.1192267  0.109071
## 10471  0.0584624 -0.6546538  0.9249049 -0.155300
## 10481  0.0338508 -0.0517183  0.6358034 -0.121397
## 10491 -0.0008835  0.2184892  0.1168633  0.051627
## 10501 -0.1391549  0.2987921  0.2857251  0.160173
## 10514 -0.1393596  0.0105597  0.0001455  0.298122
## 10521 -1.0084701 -0.0984077 -0.2970485 -0.691239
## 10531 -0.0208262  0.1492657  0.0611191  0.105895
## 10541  0.0033281  0.0830097 -0.0201502  0.111891
## 10551 -0.1944855  0.1628198  0.1866606  0.283938
## 10561 -0.4622435  0.1271368 -0.0070750 -0.281976
## 10571 -0.5619888 -0.0860520 -0.2854542 -0.418382
```

```
## 10581  0.0989609 -0.0512854 -0.2150067  0.074451
## 10591 -0.6869674 -0.0536195 -0.1726254 -0.301085
## 10601 -0.0260177 -0.0188530 -0.1021779  0.191747
## 10614 -0.0879724 -0.2218032  0.7258104  0.030333
## 10621 -0.1119785 -0.5759743  0.7469526 -0.067700
## 10631 -0.0828587 -0.5137840  0.7264762  0.068256
## 10641 -0.0425052  0.0740153  0.0005218  0.164888
## 10651 -0.1547040  0.1508079  0.1490728  0.247408
## 10661 -0.0472547 -0.0133419 -0.0830055  0.211679
## 10671 -0.0260177 -0.0188530 -0.1021779  0.191747
## 10681 -0.0260177 -0.0188530 -0.1021779  0.191747
## 10691 -0.1630550  0.1646484  0.0952330  0.058608
## 10701  0.0295787  0.1741290  0.0532261  0.040457
## 10714  0.0123891  0.1144616  0.0051773  0.087234
## 10721  0.0587268 -0.0408445 -0.1786840  0.112212
## 10731 -0.0950936  0.0679550  0.0284629  0.223661
## 10741 -0.0618241  0.1834374  0.1214583  0.133128
## 10751 -0.1762809  0.1087307  0.1212925  0.290441
## 10761 -0.3122727 -0.0326435 -0.1285917 -0.014861
## 10771  0.0533253  0.2565564  0.1196030 -0.024162
## 10781 -0.3230979  0.0888659  0.1260366  0.271702
## 10791 -0.1393596  0.0105597  0.0001455  0.298122
## 10801 -0.1135577  0.0038640 -0.0231481  0.273906
## 10814 -0.2702504  0.0445264  0.1183117  0.420967
## 10821  0.0587268 -0.0408445 -0.1786840  0.112212
## 10831 -0.6583445 -0.0458237 -0.1492316 -0.245799
## 10841  0.0258531 -0.0323136 -0.1490061  0.143065
## 10851 -0.2084154  0.0284799  0.0624880  0.362933
## 10861 -0.0472547 -0.0133419 -0.0830055  0.211679
## 10871 -0.1984882  0.1119604  0.0709148  0.134622
## 10881  0.0258531 -0.0323136 -0.1490061  0.143065
## 10891 -0.1864002 -0.0234760 -0.1069401  0.092736
```

```
# Figure
par(mar=c(4,4,2,2), bty="n")
plot(test.pca_oystercatcher1,  scaling = scl, choices=c(1,2), type="n", main="", ylim=c(-3,3), x
lim=c(-3.5,3.5), xlab="PC1 = 29%", ylab="PC2 = 28%", cex.lab=2, cex.axis=2)
with(data_oystercatcher, points(test.pca_oystercatcher1, display = "sites", col = col_points, sc
aling = scl, pch = 16, cex=2))
g <- vegan::scores(test.pca_oystercatcher1, display = "species")
len <- 1
arrows(0, 0, len * g[, 1],  len * g[, 2], length = 0.05, col = c(col_afr, col_life, col_breed, c
ol_fec), lwd=8)
text(x=g[1,1], y=g[1,2], labels="Age first reproduction", col = "gray32", cex=2)
text(x=g[2,1], y=g[2,2], labels="Adult lifespan", col = "gray32", cex=2)
text(x=g[3,1]-0.5, y=g[3,2], labels="Breeding frequency", col = "gray32", cex=2)
text(x=g[4,1], y=g[4,2], labels="Fecundity", col = "gray32", cex=2)
```




```
# Test for proportion of variance explained per axe
sum_all_oystercatcher <- summary(test.pca_oystercatcher1)

prop_oystercatcher <- data.frame(
  PC = c(1:4),
  prim = c(1:4),
  adult = c(1:4),
  breed = c(1:4),
  freq = c(1:4)
)

for (i in 1:4) {
  for (j in 1:4){
    prop_oystercatcher[j,i+1] <- as.numeric(abs(sum_all_oystercatcher$species[i,j])/sum(abs(sum_
all_oystercatcher$species[i,])))
  }
}

prop_oystercatcher
```

```
##   PC       prim      adult      breed      freq
## 1  1 0.08580355 0.38839510 0.46250494 0.1204486
## 2  2 0.41987399 0.09649716 0.05551811 0.4002845
## 3  3 0.35773304 0.26378659 0.11898052 0.2532864
## 4  4 0.13658942 0.25132115 0.36299643 0.2259804
```

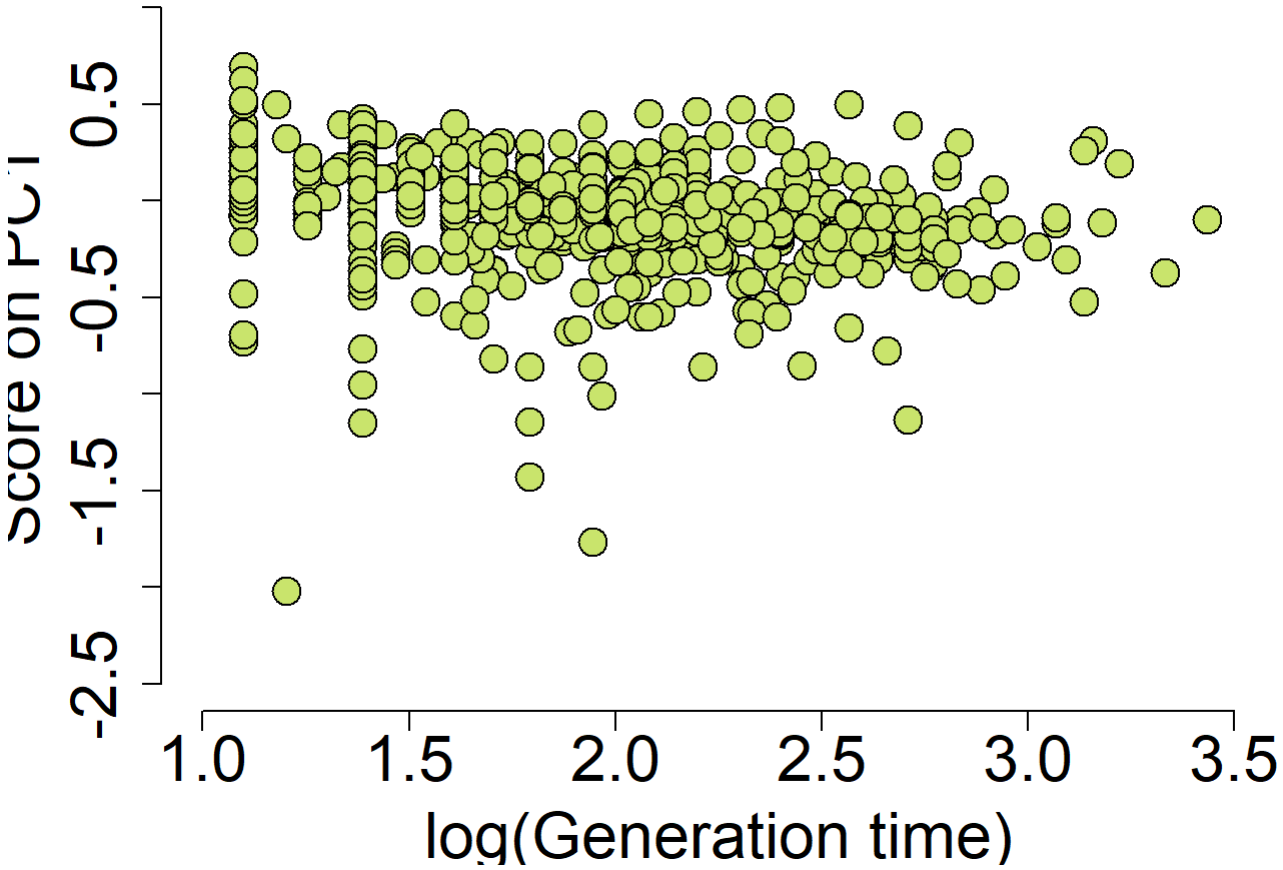
```
# Covariances
test <- as.matrix(scale(log(data_oystercatcher[,c(2,3,4,7)])))
cov(test)
```

```
##                 age_first_repro lifetime_adult  breed_freq      fec_one
## age_first_repro      1.00000000   -0.044383768  0.02702281 -0.117165603
## lifetime_adult      -0.04438377    1.000000000 -0.15845733  0.006397973
## breed_freq           0.02702281   -0.158457329  1.00000000  0.080264716
## fec_one             -0.11716560    0.006397973  0.08026472  1.000000000
```

```
# Correlation with generation time
individual_score_oystercatcher <- as.numeric(vegan::scores(test.pca_oystercatcher1)$sites[,1])
summary(lm(individual_score_oystercatcher ~ log(data_oystercatcher$generation_time)))
```

```
##
## Call:
## lm(formula = individual_score_oystercatcher ~ log(data_oystercatcher$generation_time))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.14874 -0.05540  0.01458  0.10284  0.66305
##
## Coefficients:
##                                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)                            0.39140    0.02583   15.15   <2e-16
## log(data_oystercatcher$generation_time) -0.21576    0.01375  -15.70   <2e-16
##
## (Intercept)                            ***
## log(data_oystercatcher$generation_time) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2224 on 1087 degrees of freedom
## Multiple R-squared:  0.1848, Adjusted R-squared:  0.184
## F-statistic: 246.4 on 1 and 1087 DF,  p-value: < 2.2e-16
```

```
par(bty="n")
plot(log(data_oystercatcher$generation_time), individual_score_oystercatcher, pch=21, xlab="log
(Generation time)", ylab="Score on PC1", xlim=c(1,3.5), ylim=c(-2.5,1), bg=colors[11], cex=2, ce
x.axis=2, cex.lab=2)
```



Correlation between species generation time and

percentage of variance on PC1

```
# Compile all proportion of variance on PC1
# Proportion of variance on PC1
ev_squirrels <-test.pca_squirrels1$CA$eig
pc1_squirrels <- as.numeric(ev_squirrels[1])/sum(as.numeric(ev_squirrels))

ev_dipper <-test.pca_dipper1$CA$eig
pc1_dipper <- as.numeric(ev_dipper[1])/sum(as.numeric(ev_dipper))

ev_goats <-test.pca_goats1$CA$eig
pc1_goats <- as.numeric(ev_goats[1])/sum(as.numeric(ev_goats))

ev_sheep <-test.pca_sheep1$CA$eig
pc1_sheep <- as.numeric(ev_sheep[1])/sum(as.numeric(ev_sheep))

ev_fulmar <-test.pca_fulmar1$CA$eig
pc1_fulmar <- as.numeric(ev_fulmar[1])/sum(as.numeric(ev_fulmar))

ev_oystercatcher <-test.pca_oystercatcher1$CA$eig
pc1_oystercatcher <- as.numeric(ev_oystercatcher[1])/sum(as.numeric(ev_oystercatcher))

ev_petrel <-test.pca_petrel1$CA$eig
pc1_petrel <- as.numeric(ev_petrel[1])/sum(as.numeric(ev_petrel))

ev_WA <-test.pca_WA1$CA$eig
pc1_WA <- as.numeric(ev_WA[1])/sum(as.numeric(ev_WA))

ev_bbalbatross <-test.pca_bbalbatross1$CA$eig
pc1_bbalbatross <- as.numeric(ev_bbalbatross[1])/sum(as.numeric(ev_bbalbatross))

ev_btits <-test.pca_btits1$CA$eig
pc1_btits <- as.numeric(ev_btits[1])/sum(as.numeric(ev_btits))

ev_gtits <-test.pca_gtits1$CA$eig
pc1_gtits <- as.numeric(ev_gtits[1])/sum(as.numeric(ev_gtits))

ev_sparrow <-test.pca_sparrow1$CA$eig
pc1_sparrow <- as.numeric(ev_sparrow[1])/sum(as.numeric(ev_sparrow))

ev_deer <-test.pca_deer1$CA$eig
pc1_deer <- as.numeric(ev_deer[1])/sum(as.numeric(ev_deer))

ev_seal <-test.pca_seal1$CA$eig
pc1_seal <- as.numeric(ev_seal[1])/sum(as.numeric(ev_seal))

ev_humans <-test.pca_humans1$CA$eig
pc1_humans <- as.numeric(ev_humans[1])/sum(as.numeric(ev_humans))

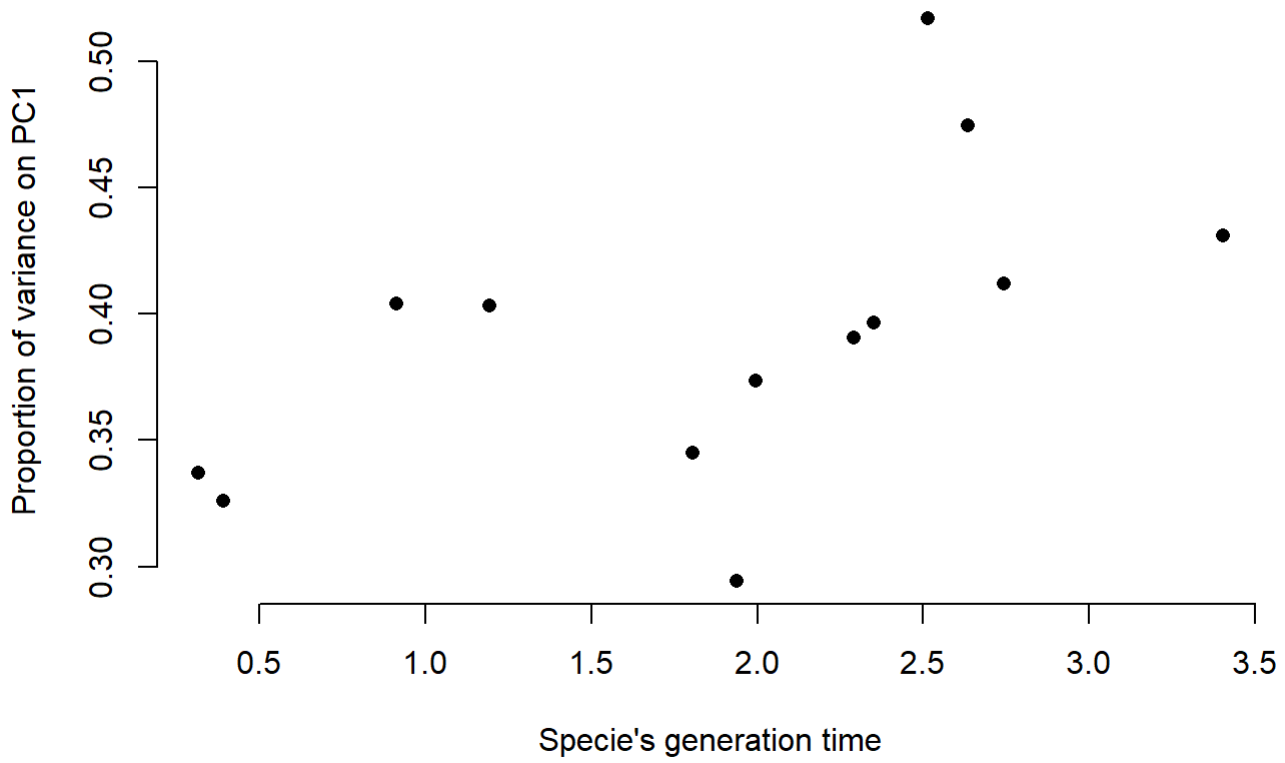
ev_gull <-test.pca_gull1$CA$eig
pc1_gull <- as.numeric(ev_gull[1])/sum(as.numeric(ev_gull))
```

```
ev_marmots <-test.pca_marmots1$CA$eig
pc1_marmots <- as.numeric(ev_marmots[1])/sum(as.numeric(ev_marmots))

pc1 <- c(pc1_fulmar, pc1_sheep, pc1_bbalbatross, pc1_btits, pc1_dipper, pc1_squirrels, pc1_gtit
s, pc1_sparrow, pc1_humans, pc1_goats, pc1_oystercatcher, pc1_gull, pc1_deer, pc1_petrel, pc1_W
A, pc1_seal, pc1_marmots)

# Remove great tits, blue tits, Weddell seal, golden-mantled ground squirrel
pc1 <- pc1[-c(4,6,7,16)]

par(bty="n")
plot(log(table_summary[-c(4,6,7,16), "mean_gentime"]), pc1, pch=16, xlab="Specie's generation ti
me", ylab="Proportion of variance on PC1")
```




```
test <- lm(pc1~log(table_summary[-c(4,6,7,16), "mean_gentime"]))
summary(test)
```

```
##
## Call:
## lm(formula = pc1 ~ log(table_summary[-c(4, 6, 7, 16), "mean_gentime"]))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.10055 -0.01695 -0.01280  0.03575  0.10140
##
## Coefficients:
##                                                   Estimate Std. Error t value
## (Intercept)                                        0.32458    0.03386   9.585
## log(table_summary[-c(4, 6, 7, 16), "mean_gentime"])  0.03618    0.01622   2.230
##                                                   Pr(>|t|)
## (Intercept)                                       1.13e-06 ***
## log(table_summary[-c(4, 6, 7, 16), "mean_gentime"])   0.0475 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0526 on 11 degrees of freedom
## Multiple R-squared:  0.3114, Adjusted R-squared:  0.2488
## F-statistic: 4.974 on 1 and 11 DF,  p-value: 0.04751
```

Comparison of proportion of variance explained by

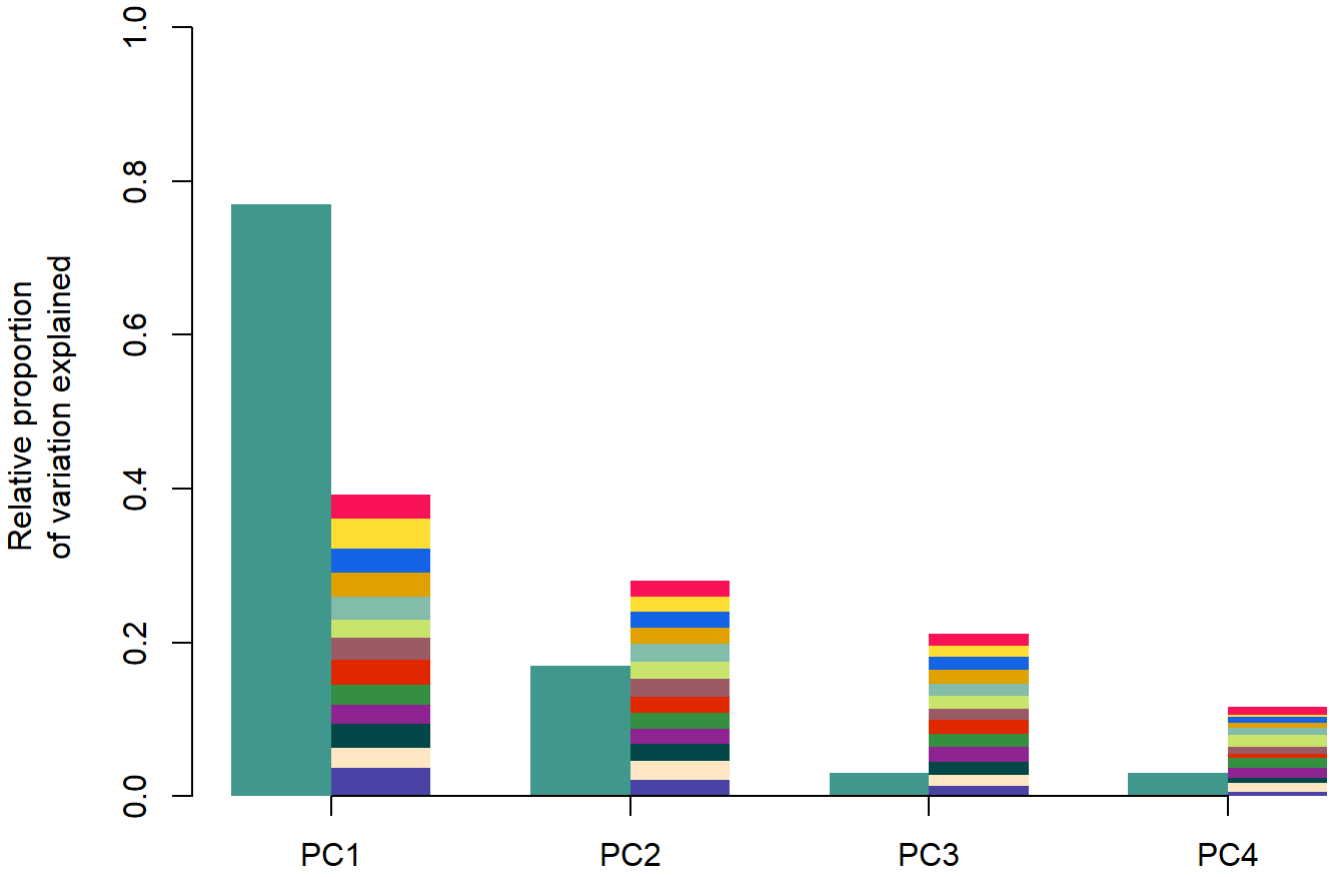
PC among and within species

```
# need to remove great tits, blue tits, squirrels and weddell seals
pc_imp <- data.frame(
  species = c(1:13),
  PC1 = c(1:13),
  PC2 = c(1:13),
  PC3 = c(1:13),
  PC4 = c(1:13)
)

for(i in 1:4){
pc_imp[,i+1] <- c(sum_all_fulmar$cont$importance[2,i],
                  sum_all_sheep$cont$importance[2,i],
                  sum_all_bbalbatross$cont$importance[2,i],
                  #sum_all_btits$cont$importance[2,i],
                  sum_all_dipper$cont$importance[2,i],
                  #sum_all_squirrels$cont$importance[2,i],
                  sum_all_sparrow$cont$importance[2,i],
                  sum_all_humans$cont$importance[2,i],
                  sum_all_goats$cont$importance[2,i],
                  sum_all_oystercatcher$cont$importance[2,i],
                  sum_all_gull$cont$importance[2,i],
                  sum_all_deer$cont$importance[2,i],
                  sum_all_petrel$cont$importance[2,i],
                  sum_all_WA$cont$importance[2,i],
                  #sum_all_seal$cont$importance[2,i],
                  sum_all_marmots$cont$importance[2,i])
}

# interspecific level - using pPCA with average tree
sum_all_pPCA <- c(0.77, 0.17, 0.03, 0.03)

par(mar=c(3,5,2,2))
barplot(sum_all_pPCA, beside=T, ylim=c(0,1), border=NA, width = 0.5, space = 2, col=col_life, yl
ab="Relative proportion \n\ of variation explained", names.arg=c("","","",""))
barplot(as.matrix(pc_imp[,c(2:5)])/nrow(pc_imp), ylim=c(0,1), col=colors[c(1:3,5,8:15,17)], bord
er=NA, width = 0.5, space = c(3,2,2,2), add=T, axes=F, names.arg=c("","","",""))
axis(1, at=c(1.5,3,4.5,6), labels=c("PC1", "PC2", "PC3","PC4"))
```


Relative proportion
of variation explained
0.0
0.2
0.4
0.6
0.8
1.0
PC1
PC2
PC3
PC4